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Elasticity and the Strength of Materials.

A CONSIDERABLE amount of information upon elasticity is scattered through the periodicals of this and other countries, and a few books have been wholly devoted to it, but we have now before us the first great attempt of recent years to give a comprehensive view of the subject and its relation to the strength of materials.* Not only does elasticity cover all the principal phenomena of the latter: it would, if fully understood, enable us to form a much clearer conception of the ultimate constitution of matter, and is therefore of the utmost importance to men of science generally. In this volume of nearly 1,000 pages we have Dr. Todhunter's first instalment of the history of the theory, bringing us up to the year 1850, and we are indebted to Professor Pearson for a large amount of additional matter, together with a revision of the whole. In collating the work of writers of various ages and countries there is, of course, a difficulty in deciding upon and adopting a uniform terminology, but we think this has been successfully accomplished, and the present work will, as a standard of reference, go far to confirm its usage. There is so much confusion in ordinary text-books at the present day as to the use of the terms "stress" and "strain" that it is interesting to note the terminology here adopted. The word *strain* is retained, as first suggested by Rankine, for the purely geometrical consideration of distortion; *stress* is reserved for the dynamic aspect of distortion, as first accurately defined by Saint-Venant. Thus the stress across an elementary plane is the resultant of the actions, whether attractive or repulsive, which the molecules situated on one side of the plane exercise upon the molecules upon the other side, when the direction of these actions traverses the plane. "Tension" and "compression" are not used; in place of them the word *traction* is used, being positive or negative, for a *stretch* or *squeeze*, and indicating the external effort as against stress, the molecular resistance. *Shear* is used for the stress aspect of the current use of that term, while *slide* is adopted for the strain aspect. The book abounds with copious extracts in the original language of the various writers whose opinions and theories are quoted, in order that no misunderstanding may arise where important statements are involved, and these add much to its value as a standard work. With so distinguished an author and so discriminating an editor its mathematical excellence is beyond our praise; as it is the last so it is the best history of a subject which is essentially mathematical in its nature; but we shall confine our notice to the practical side of the subject, as being of more immediate interest to our readers.

Commencing about 250 years ago with Galilei, whose problems of the resistance of beams gave a foundation for the theories of elasticity, although he believed the fibres were themselves inextensible, and passing over Sir Wm. Petty, who attributed sexual characteristics to atoms, we find in the hypothesis of Hooke (1678) the first hint of the modern conception of elasticity. "*Ut tensio sic vis*" was the law he laid down for springs and elastic bodies, and although his theory was tainted with the vague and unsatisfactory notions of his day, the experimental law was of the greatest importance, and gave rise to the Mariotte-Leibnitz theory that extensible fibres resisted as their extension. Mariotte considered that half of the fibres of a bent beam were extended and the others compressed; Varignon thought the neutral surface coincided with the fibres farthest from the extended side; Jas. Bernoulli, who solved the problem of the elastic curve, thought that the force required upon the end of a beam to cause its fracture would be the same wherever the "axis of equilibrium" might be, and he, therefore, considered the position indifferent. Newton (1717) argued that the cohesive and dispersive phenomena of matter were due to attraction and repulsion among the particles, not that attraction was a cause, but only,—the same as was gravity,—"a general law of nature, the truth appearing by phenomena, while the cause was yet undiscovered." A few years after, Musschenbrock made experiments, principally with wood, to ascertain these *vires internæ*, holding that without our needing a metaphysical hypothesis as to their cause, we may determine them in each case by experiment. Büllfinger (1729) rejects the theories of Mariotte and Bernoulli, and holds that until the laws of compression are formulated the position of the neutral line must be found by experiment. The majority of early writers took but scant notice of compression, and even at the present day much remains to be done. A great difficulty in the way of progress during the seventeenth and eighteenth centuries was "the union of those theological and metaphysical tendencies of the time which so checked the true or experimental basis of physical research." J. Riccati (1750) approaches the modern conception of the conservation of energy; he says the *forza viva* spent in producing a deformation remains in the strained body in the form of *forza morta* or, in modern language, the mechanical work stored up in a state of strain must be equivalent to the energy spent in producing that strain; but the chief value of his writings lies in his method and his desire to explain the elastic property of bodies upon a purely dynamical theory. Euler (1759) applied his mathematical powers to the investigation of the elastic curve and the bending of columns with other important matters. He assumed that the moment of the forces of elasticity at any point is inversely proportional to the radius of curvature, the proof of which we do not get until we reach Poisson. Lagrange (1770) continued the study of columns, and asserted that a truly cylindrical column was more efficient than one of similar weight with an entasis, such as Vitruvius and other architects had recommended; but Hodgkinson afterwards refuted this by means of careful experiments on columns of cast iron. Coulomb (1773) places the neutral line at the middle of the transverse section of a rectangular beam, the sum of the forces of extension being equal to the sum of the forces of compression across any section. He introduced (1784) his theory of torsion, which by means of a suspended filament has afforded such an exceedingly delicate means of measuring small forces. He also formed an important conception of cohesion as applied to "les corps formés de molécules agglutinées," such as a masonry pillar, and others; he held that the difference in the cohesion of the same material in different states depends upon its capacity for receiving set-slide (*glissement*): if its parts cannot slide on each other it is brittle; if they can, it is ductile or malleable. The eighteenth century is brought to a close with an account of Girard's treatise on elasticity, which, besides a historical review, contains an exhaustive account of all that was known upon the subject at that time; speaking of it the author says,—"The whole book forms at once a most characteristic picture of the state of mathematical knowledge on the subject of elasticity at the time, and marks the arrival of an epoch when science was to free itself from the tendency to introduce theologico-metaphysical theory in the place of the physical axiom deduced from the results of organised experience."

In the opening of the nineteenth century the subject seems to have attracted attention in England, and, although from his superior attainments as a mathematician we can understand that Dr. Todhunter could not tolerate the want of such knowledge in any man professing to be a leader in science, we were not prepared for such a sweeping condemnation as the learned doctor passes upon all our "fathers" in the science of building. Young, Robison, Gregory, Barlow, Tredgold, each comes in for a portion of the discredit which is finally summed up in the following paragraph:—"It is difficult to picture the remarkable scientific ignorance of practical men in England in the first quarter of this century. One can only trust that there may be a closer union of practice and theory in our own day." No doubt the practical men would be more reliable if they had more theory to guide them; but are the theorists without blame? Have not mathematicians devoted much labour to questions of little practical value, neglecting many others for the solution of which the world of constructors is waiting? And have not the practical questions they have touched been too often left involved in obscure mathematical language?

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* A History of the Theory of Elasticity and of the Strength of Materials, from Galilei to the present Time. By the late Isaac Todhunter, D.Sc., F.R.S. Edited and completed for the Syndics of the University Press by Karl Pearson, M.A., Professor of Applied Mathematics, University College, London. Vol. I. Galilei to Saint-Venant, 1639-1850. Cambridge: University Press. 1886.

Young (1807) originated the modulus of elasticity: it was then a modulus of length, but, as now known, is one of weight. He added but little to the subject under review. "Without making any very definite statements, he would appear to ascribe the properties of cohesion and elasticity to the existence of the ultimate material particles in an ethereal medium, which, in some fashion, produces between them apparent forces." He appears, however, to have been among the first who laid marked stress on the distinction between lateral adhesion and direct cohesion; he was also the first to state the general theorem of resilience. Belli (1814) remarks that two opinions have been held as to molecular force: "Newton and his followers maintained that molecular force was quite distinct from the force of gravity or universal attraction; whilst, more recently, Laplace had suggested that it was only a modification of gravity." He opposes the latter view, relying upon the argument furnished by the fact that a drop of water will remain in equilibrium hanging from a horizontal surface, where the attraction of the drop on its lowest particle must be strong enough to overcome the attraction of the whole earth. Binet (1814) has the credit of first discovering the fundamental principle that spiral springs act chiefly by torsion. Biot (1816) attributes the elastic properties of bodies to their molecular construction and to forces between these molecules. G. Rennie (1817) made several experiments on the strength of materials, particularly cast iron, and gave some facts of practical experience for mathematicians to work upon. P. Barlow (1817) assumed that the sum of the moments of the tensions of the extended fibres about the neutral point of any section must be equal to the sum of the moments of the compressed fibres; Hodgkinson objected to this, and Barlow afterwards (1837) accepted Coulomb's principle. Tredgold (1822) calls down the full wrath of our author on account of his rejection of fluxions as a necessary branch of study, "Such is the *scientific* capacity of the man whose works remained for years the standard text-books of English engineers!" Hodgkinson (1822) adds some important deductions from his experiments on cast iron, among which we find that "the *moduli* for extension and compression are not exactly equal, hence the neutral line does not exactly pass through the centres of gravity of the sections; the difference, however, is so small that it does so very approximately." He proved experimentally that a cast-iron girder should have unequal flanges in the ratio of the tensile and compressive resistance of the metal, while for wrought iron the ratio being practically equal, the flanges should be equal. The author adds, "We have referred thus at length to Hodgkinson's second paper (1831) because it suggests several points which have not received full treatment at the hands of the mathematician. Notably the difference in character between cast and malleable iron, the range of imperfect elasticity, and the shape of the beam of the greatest absolute strength, are all points which seem capable of mathematical treatment with advantage to both theory and practice. The mathematician cannot fail to be struck with the *very small* portion of the phenomena presented by a material subjected to continuously-increasing strain, which is covered by the current theory of elasticity." The decade from 1820 to 1830 shows a remarkable progress in the theory of elasticity; during this period the theory was definitely established, and its broad outline completed. "It is entirely to French scientists that we owe this great contribution to a wider knowledge of the physical universe, and however we may regard the relative merits of Navier, Poisson, and Cauchy, there cannot be the least doubt as to their dividing between them the entire merit of the discovery." Navier (1821) gave for the first time the general equations of equilibrium and motion which must hold at every point of the interior of a body, as well as those which must hold at every point of the surface. He also considered many practical questions, as the limits of safety for various kinds of stress, the equilibrium of masses of earth, arches, continuous beams, &c. During this period we have also the contributions of a lady, Mdlle. Sophie Germain, the pupil and friend of the great mathematician Lagrange, who invented the calculus of variations. She was herself no mean mathematician, and succeeded in finally establishing the equation for the normal vibrations of a plate. Laplace (1825), in his celebrated "Mécanique Céleste," says, with reference to forces which are sensible only at imperceptible distances:—"Dans ma théorie de l'action capillaire, j'ai ramené à de semblables forces les effets de la capillarité. Tous les phénomènes terrestres dépendent de ce genre de forces, comme les phénomènes célestes dépendent de la gravitation universelle. Leur considération me parait devoir être maintenant le principal objet de la philosophie mathématique." He devotes some space to the investigation of the attraction of one sphere on another, but does not much help the present subject. In the Memoirs by Savart (1819-40) we have some very interesting matter relating to elasticity founded upon original experiments. Although he deals principally with elastic vibrations as regards their relationship to the theory of sound, yet valuable hints may be derived therefrom upon the structure of elastic bodies, and a wide field is opened out for the verification of his results by mathematical processes. Lagerhjelm (1827), a Swedish physicist, showed that within the limits of elasticity all kinds of iron,—hard, soft, or brittle,—possessed the same degree of elasticity, *i.e.*, the modulus of elasticity was identical, notwithstanding that the limit of elasticity itself was greater for the harder irons. According to Lagerhjelm, the breaking-weight increases with the limit of elasticity, and is nearly proportional to it; also, "if a beam or wire be subject to tension, which produces a permanent extension, its limit of elasticity is increased, and, in proportion to its diameter, it possesses a greater absolute strength." The same writer shows that a permanent set produces an increase of volume. Poisson (1814–28), as a great master of analysis, is dealt with very fully, particularly section 6 of his "Mémoire sur l'équilibre et le mouvement des corps élastiques," which is the first investigation of the problem of the elastic plate from the general equations of elasticity, and which gave rise to much controversy; section 7 is devoted to the application of the formulæ. In his Memoir of the general equations of equilibrium, &c. (1829), he refers to *caloric* as supplying a repulsive force, in addition to the attractive force which may be supposed to arise from the action of particles of matter on each other. His writings are of the greatest value in elucidating the general subject of elasticity, and many of the most important problems are due to his initiative. Contemporary with Poisson was another celebrated elastician, Cauchy, whose attention was directed to the subject by being appointed one of the Commissioners to examine the memoir sent to the Paris Academy by Navier. His theory included the six stress-components which have to be considered at any point, the stress ellipsoid, &c., and he originated what is known as Cauchy's Theorem. At this time an advance was made in the science of elasticity by the transition from the consideration of the forces upon a molecule exerted by its neighbours, to the consideration of the stress upon a small plane at a point. He was invited by the Academy to write a treatise on Molecular Mechanics, but this was never accomplished, his literary work consisting principally of detached memoirs published in the "Comptes Rendus." Cauchy observes that a disturbing element is introduced into the equations if we consider a homogeneous body as built up of a system of molecules and each molecule as in itself a system of atoms. The experiments on wires in connexion with the Geneva suspension bridge (1824) cause the remark that "they bring out various physical facts which are too often omitted in the theoretical consideration of traction problems, and for which no comprehensive mathematical theory has yet been propounded." In Rondelet's "L'Art de Bâtir" (1830) we have mention of some of the first recorded experiments on adhesion, but they are confined to mortar and plaster, and were made in 1787. He found that when two stones were united by mortar the separation occurred in the middle of the thickness of the joint, and not following the surfaces; whereas with plaster the contrary took place. We are told that this preponderance of adhesion over cohesion in mortar compares with that of glue in Bevan's experiments, but the figures quoted (Art. 374) hardly bear out this statement.

Weber (1830) first drew attention to the importance of considering the influence of temperature on stress, and made some interesting experiments on wires under traction. In 1835 he discovered the remarkable phenomenon now known as elastic after-strain or "Weber effect"; to explain this "he supposes the ultimate particles of the body to have three axes, and the angles made by these axes with the central distances of adjacent particles to be capable of variation; the complete equilibrium for any applied load denotes a certain relative position of these axes for neighbouring particles, but this position can be attained only after a long interval of time." About this period the contraction at point of fracture received some attention, and owing to the increasing number of practical experiments under various conditions, together with the minute attention bestowed upon them, many physical problems were propounded which mathematicians have not yet fully elucidated. Vicat (1830) pointed out the omission of *shear* and *slide* from the ordinary theory then current in practical books; they had, however, been the subject of investigation by various experimenters. He also insists upon the distinction which must be drawn between instantaneous and permanent loads. His experiments on compression confirm the modern theory that rupture by pressure is produced by lateral extension. Those on short beams of non-fibrous material built in at one end, show that when the rupture takes place at a built-in end the surface of fracture is always curved in certain definite ways, which are *très prononcés* for a short beam, but cease to be appreciable when the length becomes considerable. Ampère (1832) appears to have been the first to clearly distinguish between particles, molecules, and atoms: a particle is an infinitely small portion of a body which still retains the nature of the body: the molecule is essentially solid, and cannot be broken by mechanical force, only by chemical force; with regard to atoms, the only statement that can be made with certainty is that they are absolutely indivisible. "Molecules as a whole can vibrate: from this arise the phenomena of sound; their atoms can also vibrate: from this arise the phenomena of heat and light." Belli (1832) argues against the attributing of cohesion to gravitating force, and recounts the three current hypotheses of the nature of matter, viz.: Bodies are formed of minute extended particles separated by distances not much greater than their diameters (Newton): Molecular distances are incomparably greater than molecular diameters (Laplace): Bodies do not consist of discontinuous molecules in a vacuum, but of discontinuous vacua in a continuous matter (Bernoulli and Euler). Belli himself concludes that in every disposition of matter it would be necessary to suppose bodies to have "una enorme rarità di tessuto e una enorme densità della materia, se vi voule che la coesione possa dipendere dalla gravitazione." Piola (1833-6) applies the mathematical methods of Lagrange and Poisson, and analyses the theory of elasticity, but he does not appear to advance the subject to any extent. Gerstner (1833) in a series of careful experiments on pianoforte wires, made the important discovery that the elastic strain even after the beginning of set remains proportional to the load, and that when such a wire is reloaded no further set occurs until the previous load has been exceeded. Bandrimont (1835) pointed out that, owing to the "worked state" of wires, their elastic character was very peculiar, and that such material did not present uniformity in its elastic constants. The Transactions of the Inst. C.E. for 1836 contain a paper by Tredgold on tension, where he shows the importance of making the load exactly axial with the bar in all structures. Avogadro (1837) gives a good account of the state of mathematical and physical knowledge at that time, but contributes no original work. Brix (1837) tested French and German iron in comparison, and carefully noted the results; he found that the strain after the beginning of set consisted of two parts,—a purely elastic part following Hooke's law, and a set for which he could discover no law; he also proved that a given load will only produce a definite amount of set, however long maintained. His tabulated results showed clearly the position of the yield-point, but he appears not to have noticed its existence. He observed that rolling and wire-drawing produce a change in the elastic conditions of the surfaces. Duhamel (1835) contributes some problems upon thermo-elasticity. Leblanc (1839) notices an important practical point, that long wires have a less breaking load than short ones of the same diameter, because there is greater probability of small flaws occurring. Hodgkinson's experiments on cast-iron (1840) naturally receive some attention, but although they were more exhaustive than any preceding them, and were of great practical value, our author is unable to found any mathematical theory upon them beyond a modification of Euler's theory for columns. It appears to be very desirable that mathematical and technical experts should be associated in carrying out such experiments, in order that the physical results may be noted in such steps as will ensure their mathematical value. Theory must be founded on practice, but practice can only make progress when theory lends her aid. Poncelet (1839), to whom we owe the introduction into practical mechanics of the principle of energy, gave courses of lectures wherein several points relating to elasticity were first treated. They were published in various editions, known generally as the "Mécanique industrielle." Among other things he described the *résistance vive d'élasticité*, or work done in deforming a bar up to its elastic limit, and represented graphically by the use of curves the result of several experiments. He was the first to give "an accurate graphical representation of the traction-stretch relation for bars subjected to terminal tractive load." He also went very fully into the question of resilience, and was instrumental in advancing the general theory.

In 1826 a small band of French military engineers in the Russian service, of whom Lamé and Clapeyron were the chief, was formed into a Commission for investigating the subject of the most suitable iron for suspension bridges, and to their labours are due many interesting facts and theories. The want of isotropy in iron bars, the properties of the state of ease, the conditions of the yield-point, Lamé's stress ellipsoid, and the existence of principal tractions, are among the points established. Considerable space is devoted to an account of Lamé's mathematical work, but this does not appear to be directly based upon physical axioms, and is of purely theoretical interest.

The chief feature of the decade 1830-40 is thus seen to be a richness of physical results which gave a broad basis for a reciprocal development of theory.

In the next decade we find a remarkable activity in all branches of research. "On the technical side it is no longer suspension-bridges, but practical railway needs, which call forth not only innumerable experiments on iron, but corresponding developments of theory. . . . . The technical papers of the period abound with material suggesting profitable lines of mathematical or physical investigation."

Hausmann (1840) notes that after rupture has taken place in a bar of wrought iron at the section of stricture, the strictured ends of the bar were found to be strongly magnetised when tested upon iron filings. Masson (1841) attempted to set up a relation between the elasticity of a substance and its atomic weight, but the experiments were not very conclusive. Brewster, relating his researches on the polarising effect of strain upon glass and other bodies, suggested that models of arches should be made of glass, and so the stress in different parts of the arch rendered visible by exposure to polarised light, though we are not aware that this proposal was ever carried out. Neuman (1841) starting from Brewster's researches developes a theory for the analysis of strain by means of its double-refracting influence on light: his chief object was to determine the fringes produced by a given strain; but naturally the converse problem is of more importance. He also compares the effect of temperature with that of load in producing a change of density. One great difficulty that English engineers,—and not engineers alone,—have laboured under has been a very imperfect knowledge of the labours of scientific men of other countries, and only within quite recent years has any practical step been taken to remedy this; we refer to the copious extracts from foreign periodicals and books now found in every volume of the Transactions of the Inst. C.E. These place engineers in the present day *en rapport* with their co-workers abroad, and are of inestimable value. This difficulty was fully appreciated by Moseley, who, in his "Mechanical Principles of Engineering and Architecture" (1843), reproduced much of what was useful in the writings of Poncelet and others. Stokes (1849) contributed some important papers upon the vibratory motion of elastic solids, and a mathematical analysis of experiments on the effect of moving loads upon railway bridges. Wertheim (1842) experimented upon all the principal metals to determine the stretch-modulus, limit of elasticity, electro-elastic and magneto-elastic properties of bodies. The true elastic limit is considered to be "the stretch at which stress ceases to be proportional to strain," but he measured it as "the stretch at which set commences," and these are not necessarily the same. His contributions to physical elasticity are, however, among the most important of the period. Person (1848) considered that the work done in separating the molecules of a substance mechanically ought to be related to the heat required to separate them by fusion, but we fail to see any analogy between the two cases. In 1848 Küpffer commenced his exhaustive experiments on the vibrational constants of elasticity, and the temperature effect; according to the author, his experiments "conclusively prove that either isotropy possesses two constants, or that wires possess a cylindrical arrangement of elasticity, *i.e.*, are æolotropic."

In 1849 we have the Report of the Commissioners on the Application of Iron to Railway Structures, containing the opinion of nearly all the leading British engineers of that day, and a detailed account of experiments upon the effect of continuous and intermittent loads, of long-continued impacts, of moving loads, &c., carried out upon a large scale and with every regard for accuracy. This Report caused a great activity in the discussion of the general subject of molecular mechanics, and the practical use of wrought and cast iron, and is, of course, well known to all practical men; it is, in fact, the "corner stone" of their structural work in iron, but it may not be out of place to recapitulate a few of the conclusions arrived at. The dead load on girders should not be more than one-third to one-fifth the breaking load; travelling load, causing vibrations, should not be more than one-third to one-tenth of the breaking load, the majority being in favour of one-sixth. According to the evidence of nearly all the practical men, a girder was supposed to be deflected less by a load moving at a high velocity than by the same load at rest; Hawkshaw, P. Barlow, and R. Stephenson, however, held the contrary view, which we now know to be the correct one. Some interesting evidence was given as to the change of molecular structure in iron by long-continued vibrations, tough and fibrous metal being reduced to a crystalline and brittle state, but, on the whole, this change appears to be brought about from repeated *transverse* impulse, and to be absent in the case of *longitudinal* impulses only. Homersham Cox (1848) ingeniously applied some well-known elementary principles to formulate the elastic equations, and obtained close approximations in a very simple manner. Hodgkinson's experiments covered a very wide field. In addition to his better-known work, he tested bricks and building stones; he found that sandstone failed in crushing by the formation of a wedge fracture as in cast-iron, while limestone formed perpendicular cracks and splinters. The change of shape in the cross section of a solid rectangular wrought-iron bar under transverse stress must have presented itself to many experimenters, but it is first noted and figured in Clark's "Tubular Bridges," where it resembles "the elastic figure obtained from Saint-Venant's theory of flexure." According to Clark, if a bar be put under initial transverse stress, by bending hot and straightening cold, the deflection is decreased, and the bar gains in absolute strength, although from theoretical considerations it seems very doubtful whether the absolute strength of a body (its limit of cohesion) can be increased in this way, and further experiments are needed.

A most important remark by the author upon the criterion of strength for permanent structures is contained in the following sentence:—"It cannot be too often reiterated that the theoretically best form of a section for a beam to be loaded only below the elastic limit by no means necessarily coincides with the section of beam of greatest strength." All the investigations of physicists and mathematicians into stress-strain relations tend to substantiate this opinion, yet, with the exception of Box, we can call to mind no popular writer of the present day who gives any heed to it in fixing the limit of safe load in structures. Fairbairn, in experimenting upon iron plates for shipbuilding (1850) found a very slight difference between the absolute strength of plate and bar iron, also between the strength of a plate torn through or across the fibres. As now made, the material shows very decided differences. We need not on that account impeach the accuracy of the experiments, which were doubtless correct for the material employed, but in utilising the results we must be guided by the present circumstances of manufacture. Haughton (1846-54) incidentally adds to the theory of elasticity, but is principally concerned with establishing the laws of the undulatory theory of light. Jellett (1850), employing Lagrange's method, investigated the equations for an elastic solid, the solid being regarded as an aggregate of molecules, and considered the hypotheses of both independent and modified action. Clerk-Maxwell (1850), among other interesting problems, follows up Brewster's suggestion of determining the nature of a strain in an elastic solid by means of the colour-fringes exhibited by polarised light, and furnishes a graphical solution of the problem.

The closing chapter is specially devoted to the researches of Saint-Venant before 1850. This renowned elastician "had a keen appreciation of practical needs combined with a wide theoretical grasp of which it would be hard to discover another example in the history of our subject." Although many valuable discoveries had been made, they were not current in the practical world, being either misunderstood or ignored, and "to reinstate theory in its true place, to make the theory of elasticity of practical value, has been the life-work of Saint-Venant." He died only so recently as January, 1886, and the major part of his work will come under review in the second volume of this History. Prior to 1850, however, we owe to him the best definition of stress across an elementary plane, the true criterion of the strength of a body, the correction of the Bernoulli-Eulerian theory of flexure by the consideration of slide, and that of torsion by the discovery of the distortion of the primitively plane section. Note B in the Appendix by Professor Pearson, upon terminology and notation, will repay careful perusal before reading the History; the remainder of the Appendix, with its diagrams, will be better appreciated after tracing the gradual development of the theory, and many suggestive remarks will be found to give food for reflection until the appearance of the next volume. A word of praise is due to the very complete index prepared by Mr. Beare; the entries appear to have been made with judgment, and really form a concise summary under each head.

Although our notice of this work has extended to some length, we have given but a faint idea of the mass of information it contains, and particularly of the detailed mathematical investigations which are inserted and discussed throughout, and we have not even referred to the great controversies respecting multi- and rari-constancy, uni-constant and bi-constant isotropy, &c., as these, although of the very essence of the subject, are of interest only to the specialist in elasticity. Naturally the book will prove somewhat heavy reading to the ordinary practical man; but no scientific library will be complete without it, and any engineer or architect aspiring to deal with the forces of nature in an intelligent manner will do well to possess himself of it.

NOTES.

IT will be remembered that nearly a year ago the House of Commons rejected a vote of 50,000*l.* for the maintenance of the London parks, on the ground that London ought to maintain its own parks other than those designated "royal parks": these include Hyde, St. James's, Regent's, and the Green Parks. But in addition to these "royal parks" Her Majesty's Office of Works has hitherto had under its control Victoria, Battersea, and Kennington Parks, and it was urged that the expense of the maintenance of these should be borne by the ratepayers of the metropolis, and should not be a charge on the national exchequer. As we said at the time, there can be no question as to the abstract justice of this proposition, and we now learn that as a consequence of the rejection of last year's vote the Government has introduced a Bill by which it is proposed to transfer the custody and maintenance of the three parks last named to the Metropolitan Board of Works and (we presume) their "successors, administrators, or assigns." The opinion we have before expressed that the Metropolitan Board has its hands sufficiently full, and more than sufficiently full, is a growing one, but seeing that the Board has created and has under its control Finsbury Park and Southwark Park, and that it has charge of such open spaces as Hampstead Heath, Blackheath, Clapham Common, Peckham Rye, and Wormwood Scrubbs, we think there will at any rate be no harm done by the transfer of the parks in question to the control of the Board as the local authority of the metropolis for the time being. The question came up for discussion at the meeting of the Board on the 11th inst., when an important communication was received from the Government, enclosing a statement of liabilities and assets which are to be taken over by the Board with the parks. A very heavy liability (nearly 200,000*l.*) rests on Battersea Park, but this may possibly be eventually covered, in great part at least, by the ground-rents of land on the margin of the park, although it appears that some doubt has been thrown on the validity of the title to this property. The Board seems to be proceeding cautiously in the matter, and Sir James McGarel-Hogg has taken steps to oppose the second reading of the Bill pending the further consideration of the matter by the Board.

THE same Bill proposes to transfer to the Board, with all obligations and assets, the control and maintenance of Westminster Bridge, the gardens adjoining the Bethnal Green Museum, and the embankment wall at Grosvenor-road, adjoining the Board's Embankment at Chelsea. With regard to these, as well as with reference to the parks, members and officers of the Board do not hesitate to express the opinion that the particulars of liabilities and assets furnished by the Government are insufficient. The Board is only doing its duty to the ratepayers by being chary of buying a "pig in a poke" or of accepting a gift in the nature of a white elephant. One of the members of the Board, we may note, spoke disparagingly of Westminster Bridge, which he characterised as "a very fragile structure."

WITH regard to the new street from Charing-cross to Tottenham Court-road, which will shortly be completed and opened, two recommendations concerning it have been made by the Works and General Purposes Committee of the Metropolitan Board of Works for consideration at the Board meeting which will be held a few hours after these lines are published. The first recommendation is "That the name 'Charing-cross-road, W.C.,' be applied to the new thoroughfare now in course of formation by the Board between Charing-cross and Tottenham Court-road." We cannot say that we think this suggestion any happier than the Board's original proposal to designate the new street from Bloomsbury to Piccadilly-circus "Piccadilly-road," for which the name "Shaftesbury-avenue" was ultimately adopted. Even supposing that the new street came right down to Charing-cross (which it does not), Charing-cross would be at only one end of the new line of thoroughfare. We were the first to suggest that the name of the great philanthropist should be associated with the street from Bloomsbury to Piccadilly, and we had the satisfaction of seeing our suggestion adopted. We now venture to make another suggestion, and that is, that the new street from Tottenham Court-road to Charing-cross should be named "Nelson-avenue, W.C." The connexion of the new street with "Trafalgar-square" will say something for this, but the strongest argument in favour of our suggestion is that the name of one who is generally regarded as the greatest naval commander England has ever seen is not given to any important street in London. "Nelson-avenue" would be popular, and no one could confound it with the three "Nelson-*streets*" which exist in other and remoter parts of the metropolis.

THE other recommendation of the Committee has reference to the improvement of the line of frontage of the new street, especially in the immediate vicinity of the National Gallery. It will be remembered that at a recent meeting of the Royal Institute of British Architects, it was announced (see *Builder*, p. 215, *ante*) that, acting on a suggestion of the standing Art Committee, the Council had decided to memorialise the Board with a view to getting a better line than that which the new street now presents at its southern end. The memorial was duly sent to the Board, and referred to the Works Committee for consideration. The Committee now report recommending:—

> "That the Royal Institute of British Architects be informed, in reply to their letter relative to the Board's new street from Charing Cross, that a line of frontage to the National Gallery has been agreed upon which is practically the same as that suggested by them; and that, as regards their proposal that the National Gallery shall be extended across Hemming's-row, this is a matter for the consideration of Her Majesty's Office of Works, &c., and not of this Board."

We venture to hope that, 'twixt Board of Works and Office of Works, not only will the opportunity of securing architectural effect at the flank-end of the National Gallery be duly secured now, but that it will be taken advantage of at no very distant date.

IN all the many changes of public opinion, scarcely anything more marked can be found than that which has reference to public spaces in towns. Thirty years ago it never occurred to philanthropic society that the regulation parks were not sufficient for the general wants; indeed, it never occurred to the people themselves what a valuable addition a few more would be to their health and pleasure. As to the commons, they were nobody's business to take care of; and if a greedy Lord of the Manor did sometimes encroach upon the rights of the parishioners, a little grumbling, or occasionally a little pulling down, took place, and nothing more was heard of the thing. But now-a-days open spaces are not only craved for, but are jealously searched for; and should some old suburban mansion, which has not been heard of since the days of Pepys, emerge from its seclusion, and be announced for sale, it is immediately pounced upon as an open space, and if there be a bit of park land and some good trees, it is sought to secure them for the public. It is only by watching these events that we can at all realise the vast absorption that is going on around us from day to day,—an absorption that will in fifty years' time make an open space of Leith Hill, and a park of the whole range of the South Downs. Last year was very successful in this particular form of legislation, and during this year, so far as we know at present, we are to have two new parks, both in quarters where they will be highly appreciated. Ravenscourt Park, Hammersmith, is familiar to tens of thousands who daily pass it by rail. The house we may dismiss, but the 32 acres are certainly very charming, and so is the avenue that leads to them from the high road. Clissold Park, Stoke Newington, is still better from a scenic point of view, for it has water,—albeit it is but the New River,—and some very lovely timber; and as it is understood that the Ecclesiastical Commissioners have power to sell, and are willing to do so for 95,000*l.*, it would be a sin if the serried rows of terraces and streets, which are even now beating at the door, should be allowed to enforce an entrance. Scarcely a week but brings some complaint through the press that some historical house is for sale, so that there need be no fear that the speculative builder will be able to make a bargain round the corner. On the whole, the community is to be congratulated that so healthy a spirit is abroad.

A USEFUL little Bill has been introduced into Parliament, which if passed will be known as the "Quarry Fencing Act, 1887." The title explains the object of this piece of legislation. It is to oblige every owner of a quarry, whether being worked or disused, to keep it safely fenced. The term quarry is to include every pit or opening made for the purpose of getting stone, slate, lime, chalk, clay, gravel, or sand. There are far too many of these places now wholly unprotected, or fenced in so fragile a manner that the so-called protection is almost worse than none, being a mere trap. We are inclined to think that in addition to a substantial fence there should be near every quarry a notice-board conspicuously placed, having the word "quarry" on it in legible letters, so that persons approaching it, either riding or driving, might be warned of its existence before getting very close to it.

THERE is no bond of federation to beat the iron rail, and we are heartily glad to see that West Australia, which has been too long out in the cold, is preparing to ally herself with her fellow colonies in a very practical and substantial manner. It is proposed by an English syndicate to make a line of 700 miles in length, from Perth to Eucla, on the land grant system, and it is believed that this offer will be accepted by the Government. As Eucla is a considerable distance inland, this line would, of course, not do very much towards bringing the colony a connexion; but it happens that this same place is only some 400 miles from Port Augusta, in South Australia; and the same syndicate has, therefore, made a similar proposal to the South Australian Government. There seems some uncertainty as to the character of the country about Eucla, but a large area between it and Perth, which was said to be waterless and good for nothing, has already been examined, and proved to be just the contrary, so that very little fear is entertained as to the remainder. Should this scheme be carried out in its entirety, a continuous railway will exist throughout the entire southern half of Australia, and it will be possible to run a through train from Perth to Adelaide, Melbourne, Sydney, and Brisbane, a journey which will take from five to six days. Partly in dependence upon this large undertaking, a land syndicate is already issuing proposals to deal with West Australian land on an extensive scale.

TWO or three days hence some old landmarks will have disappeared from Clerkenwell. Spa Fields Chapel, in Exmouth-street, and the Countess of Huntingdon's house adjoining thereto, have just been pulled down.* Their site is appropriated for the new Church of the Good Shepherd, to be built after Mr. J. D. Sedding's designs, for which an appeal is now before the public. The Metropolitan Board of Works' project for what are known as the Clerkenwell-road to Islington Improvements have involved the diversion from its hitherto uses, perhaps the ultimate extinction, of a relic of the several spring-heads which formerly fed the River of Wells, and gave so rural a character to this once favourite quarter of the town. The inner block of Coldbath-square is in the wreckers' hands. Here, behind Nos. 25 and 26, on the north-eastern side, and boarded over to protect it awhile from the falling *débris*, lies Nell Gwynne's bath. Having until very recently continued to serve their converted purpose, the frigid chalybeate waters, rising not far from the Fleet's course, were at one time sufficiently famous to give names to various thoroughfares and alleys in the immediate vicinity. Their specific virtues were first announced to the world by Mr. Walter Baynes, of the Middle Temple, who owned the property. His advertisement in the *Post Bag* informed his patients that the best route thither for carriages lay through the notorious Hockley-in-the-Hole, at foot of Ray, or Rag, street. In or about 1697 he built, on what was then the open ground of Sir John Oldcastle's field, the three-gabled bath-house whereof a view is preserved to us in the little print published by A. Bengo in 1812.

THE demolitions we speak of in the foregoing paragraph will, in all likelihood, be followed by the destruction of the Clerkenwell House of Detention, which, together with its site of about two acres, is now offered for sale. This prison was erected in 1845-47, to replace the "New Prison," which had been rebuilt in 1774-5, near to the Old Bridewell, by William Moseley, architect. The original plan consisted of four arms radiating from a common centre. To these a fifth floor was subsequently added, with two more blocks along the south-eastern and north-eastern sides. The total accommodation is for 1,000 prisoners, male and female, under remand or awaiting trial. One can plainly see from within (as also from Corporation-row) the breach that was made in the back of the outer wall, opposite to the northern exercising-ground, at the attempt to rescue the Fenian prisoners, Burke and Casey, on December 13th, 1867. The signal was given by a woman from a house in Corporation-row, which overlooks the lofty boundary-wall. But some rumour of the attack had reached the governor's ears, and Burke and Casey were not amongst the exercising party at the time. Certain movable fittings have been despatched to Holloway, Norwich, Liverpool, and elsewhere. The most interesting feature of the prison is the two-storied entrance-lodge by the main gates in St. James's-walk. This, we were told, is part of the original watch-house or lock-up. It contains an upper small apartment, now occupied as a bedroom, wherein Jack Sheppard was once confined before trial. If this be so, it may possibly form the scene of one of his celebrated exploits of prison-breaking.

THE habit of holding exhibitions of the sketches of this or that painter has one especial interest among others, that it sometimes serves to show more satisfying artistic qualities than are to be found in the same painter's more complete and larger works. Now Mr. E. H. Fahey is, in the oil paintings by which he is best known, one of the most mannered of contemporary artists, but in the series of small water-colour sketches from the Norfolk Broads, now on view at the rooms of the Fine Art Society, though this pervading manner is apparent enough, it is certainly not so pronounced or so mechanical in quality as in the finished works of the same artist; and there is more of the variety and individuality which comes of direct transcript from nature. The scenes are well chosen to convey an idea of the characteristic features of that very peculiar landscape (or waterscape). Among incidents which belong specially to the district are the immense boat-load of "Marsh Hay" (No. 9), and "The Winning Boat" (20), coming down one reach of the zig-zag river or canal, while the sails of the other yachts are seen across the land pursuing the opposite direction on another reach of the stream. The whole collection is of great topographical interest, and exhibits much refined and delicate work of its kind, though it cannot be said to belong to the highest order of landscape painting.

ONE must be thankful for small mercies when Government Departments deal with anything of an artistic nature. It would, therefore, be captious to complain of the tasteless colouring and bits of weak and meaningless design to be seen in some of the recently introduced postage stamps. It is a great gain that the insipid lilac which pervaded the last set appears only in two or three of this one. The twopenny stamp is distinctly good, and so is the colouring of some of the others, notably the bright red of the halfpenny, especially on a considerable field of white, but the zigzag margin line of the latter is nothing short of ridiculous. As to the unaltered penny stamp, no amount of getting accustomed to it will prevent our giving an occasional regretful thought to its old brick-red predecessor.

A WOULD-BE witty evening journal makes wondrous merry over its original discoveries,—by the aid of Professor Middleton's lectures,—in the domain of architecture. These discoveries are that the dado is no modern invention, but "was in fashion nearly two thousand years ago," and that the Romans were "jerry builders," to the extent of veneering some of their massive walls with thin slabs of marble. Would our esteemed contemporary be surprised to hear that the origin of the dado may be referred at least to the date of the erection of the ancient palaces of Assyria, and that a good proportion of the Roman "jerry buildings" in question have been "substantial and lasting" enough to stand "nearly two thousand years"? It is true that much of the marble was but a casing, and has disappeared, but that is a fact which few persons who had ever seen such a building would be disposed to doubt, even if there were no Slade Professor to give them the information.

Iron, Hardware, and Metal Trades' Pension Society.—The thirty-first annual ball of this charity was held at Willis' Rooms, on the 10th inst., under the presidency of Mr. D. W. M'Innes, of the Carron Company, who was assisted by numerous stewards representing the various branches of the trades throughout the kingdom. The attendance numbered 300 persons.

ON THE WORK OF SOME UNKNOWN DESIGNERS.

FROM the known we must plunge our readers back once more into the region of the unknown. We present them to-day with a series of sketches of designs, all of great excellence and some of the rarest beauty, the names of whose authors are not only wrapped in oblivion, but the object of whose existence can only be the subject of conjecture. With regard to all the works which we have hitherto examined the purpose for which they were created has been sufficiently clear. We have seen how some designs were made expressly for tradesmen's catalogues, and how these artistic catalogues were issued by jewellers, goldsmiths, locksmiths, and gunsmiths alike, in a kind of friendly rivalry, each striving to raise his own wares to the highest pitch of artistic excellence. Then, again, we have seen how a goldsmith would publish a book of ornament pure and simple, with no mercenary object in view, but merely from a desire to improve the standard of work in his own craft by instilling first principles into apprentices; and yet, again, there have been books published by artists who were not craftsmen themselves containing suggestions for those who were. In our next article we shall deal with some of the numerous books of grotesques which were published for the amusement of the world at large of the sixteenth and seventeenth centuries. But the engravings which we have now before us owe their existence to something higher than a mere sordid desire to attract purchasers; they were designed and executed out of the purest love for the art, and are invested with the charm which is inherent to all labours of love. They are simply decorative engravings, and stand on a par with those other engravings of Scriptural, historical, and fancy subjects with which the art life of three or four centuries ago was enriched. All the specimens which we have seen of the ornamental work of this period seem to have been published simply as engravings, and do not appear even to have been incorporated in books, either on friezes or tailpieces. It is just possible that some of them may have been intended as name-plates; for example, the quasi-heraldic device (fig. 3) or the V (fig. 4); but even this is doubtful, and there is nothing left for us but to imagine that they were designed for the love of the art of designing, and for the love of that art alone. The first two illustrations (figs. 1 and 2) which we give are photographic reproductions, and show both the actual size of the original plates and the style and manner in which they were engraved. The remainder of our illustrations are reproductions of sketches in which the style of the engraving is lost, but in which the design itself is preserved with great fidelity.

Apart from the very great beauty of these two engravings, the point to which we specially desire to call attention in connexion with them is the lesson they teach with regard to the shading and embossing of ornament generally. We need not recur to what has already been said as to the necessity, in criticising any design on paper, of first ascertaining whether we are looking at the actual design in the condition in which it is intended to remain, or whether we have only a drawing or representation of the design as it will appear when it comes hereafter to be wrought in wood, stone, or metal, or in the softer fabrics. The designs which we have now before us are clearly not intended to represent the *effect* of any carved or wrought work, but are simply the ornamentation for the small surfaces on which they are graven; for although the leaves are shaded, yet the flatness of the surface is not destroyed, and the appearance of actual embossing is nowhere given to them. They will serve us, therefore, as excellent examples of the due limits which should be set to shading in decoration.

In dealing with this question it will be necessary, however, to bear in mind some of the first principles of the art. In the first place, let us imagine a surface which has to be relieved of its monotonous uniformity by means of ornaments placed upon it. The simplest possible form in which this can be done is by the use of lines of uniform thickness arranged in some graceful form: a good example of this style will be seen in one of Michel Le Blond's knife-handles (fig. 8 in our issue of January 15 last). A more elaborate, but equally severe, style is based on the use of lines of varying thickness, as in the patterns known by the names of arabesques: of this style the panels by Gentsch

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* See *Builder*, November 20, 1886.

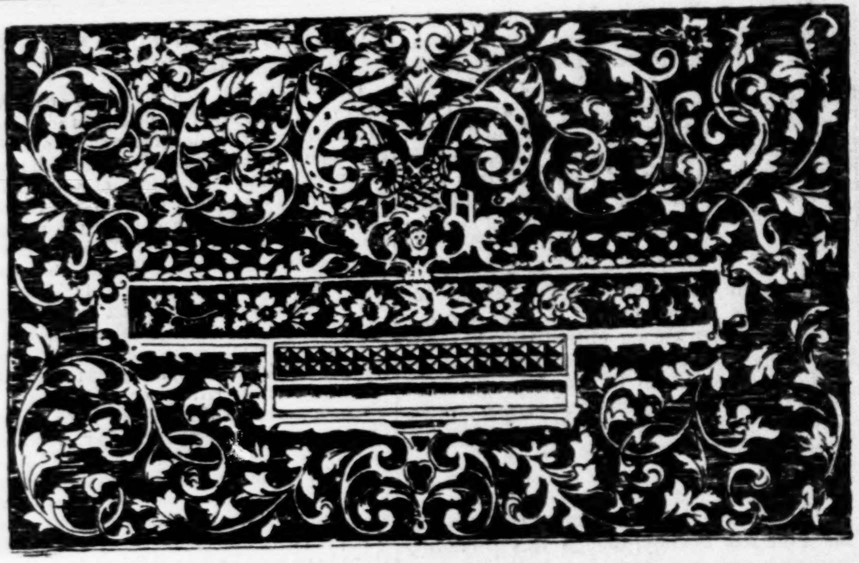


Fig. 1.

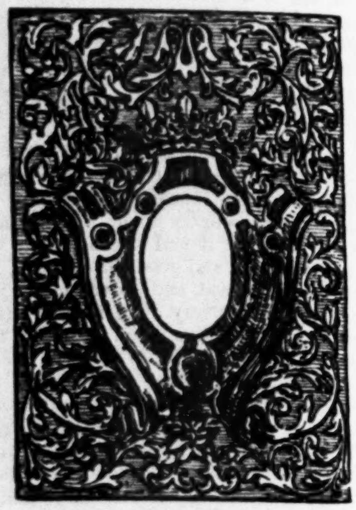


Fig. 3.

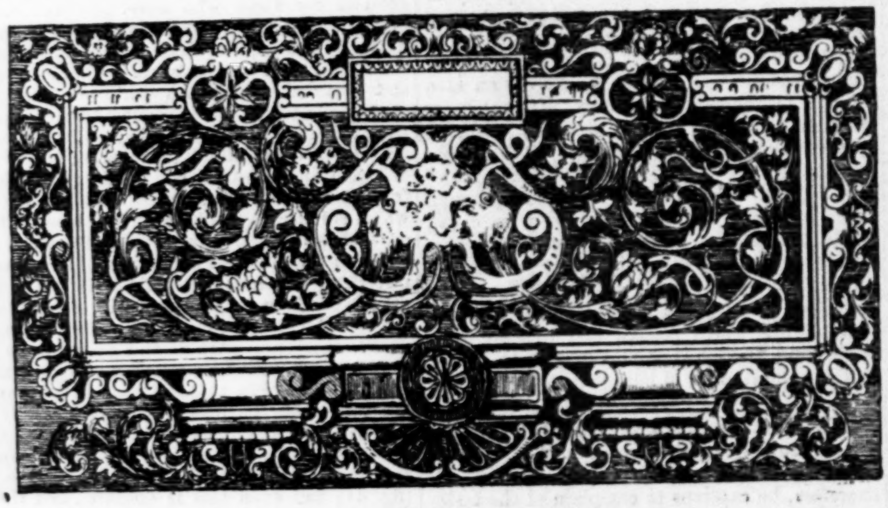
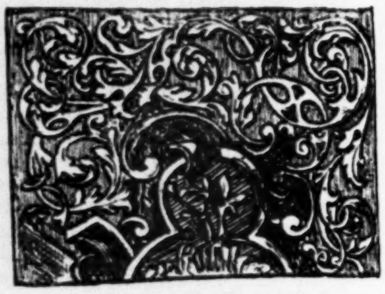


Fig. 2.



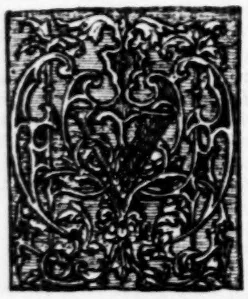


Fig. 4.

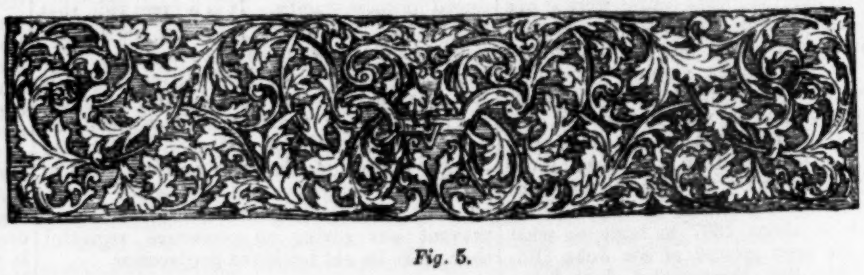
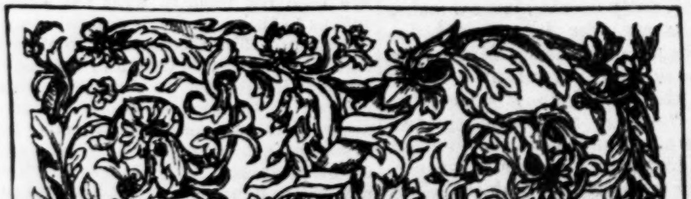
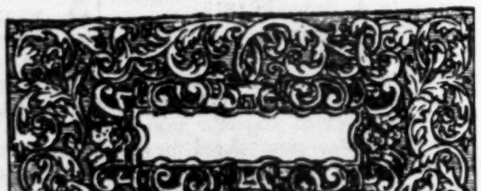
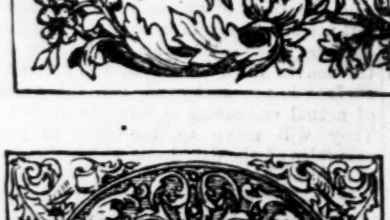
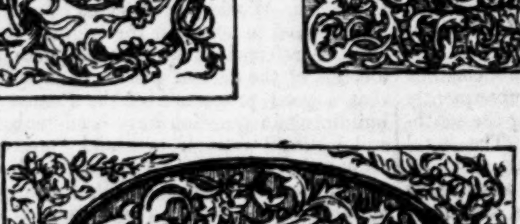


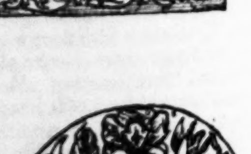
Fig. 5.











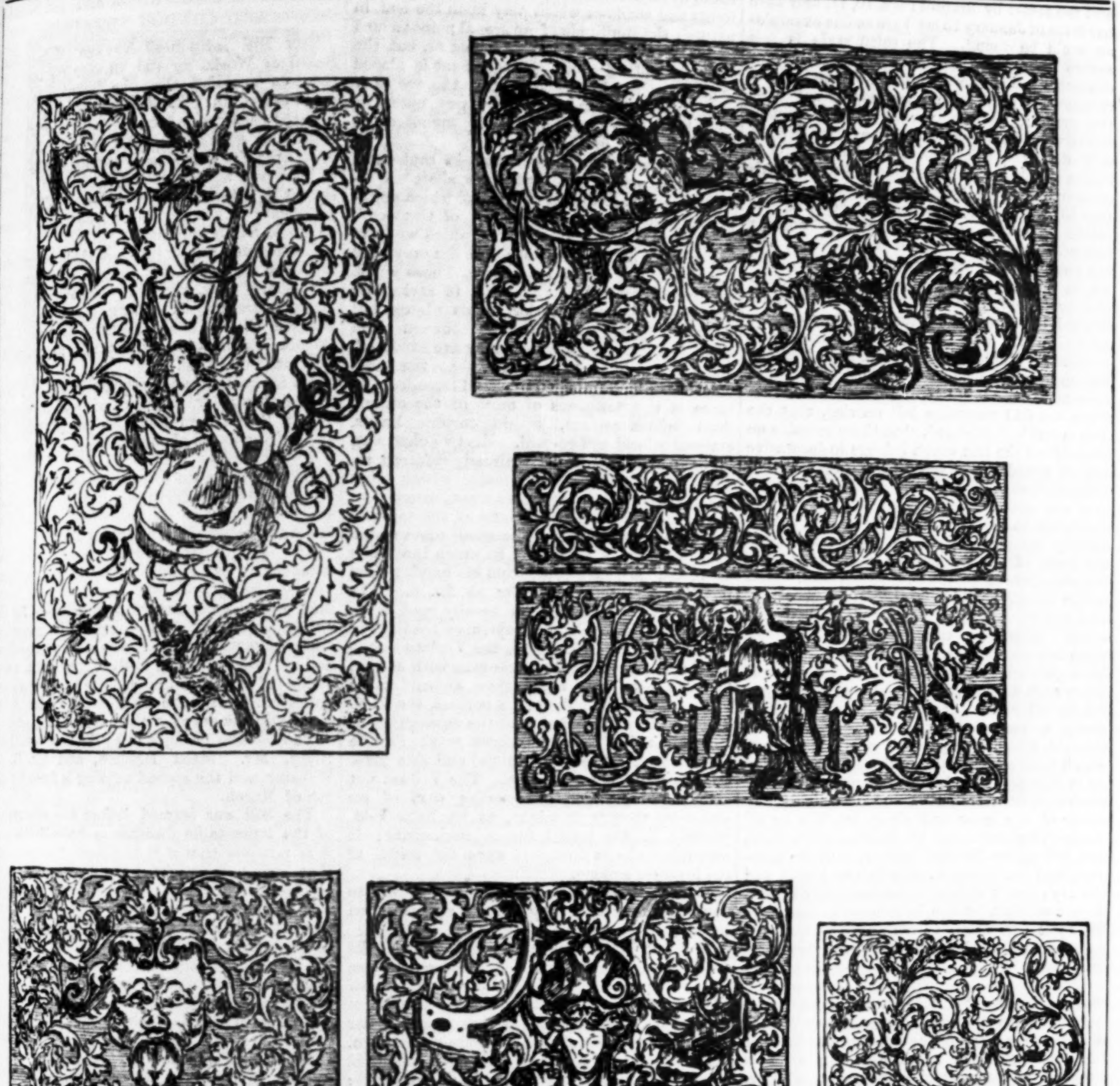


Fig. 6.

and the tablet by Brentel (figs. 10, 11, and 12 in our issue of January 15 last) are as fine examples as could be found. The third style is less severe than the two preceding ones; its characteristic is the adaptation of the lines of ornament to some form suggested by nature,—the process, in fact, which we call conventionalising: in this style the lines used are not only of varying thickness, but take the form of leaves and flowers. Referring still to our issue of January 15, Le Blond's small circular panel (fig. 13) will serve as a good example of this method. But, so far, we have got nothing beyond a flat ornament on a flat surface; and the question which then presents itself is, have we in these three styles, with any modification or amplification of them which can be devised, exhausted the resources of decorative art? Is the whole field of ornament quite covered? Will the next step take us across the line and plunge us at once into the domain of representative art? Experience shows us that there are still resources left untried, that the field is but half explored, that there remains on that side of the line which belongs to decorative art an abundance of space for the invention of another class of ornament of a peculiar fascination and grace, though of a much less severe character than even the third of the classes already mentioned. In this class not only is the form of natural objects conventionalised, but also their structure and appearance. How is this done? Now it is absolutely necessary that one further point should be clearly understood. If any one thinks that, say, a dessert-plate is a good or convenient place on which to have painted a lily or a rose, let him have as many such dessert-plates as he is pleased to pay for, by all means; if another should think, as many a very few years ago seem to have thought, that a wall-paper is a fitting place on which to have painted bunches of flowers tied up in nosegays with beautiful streamers, or the semblance of a trellis up and on which many plants of ivy grow and cling, let him by all manner of means cover his drawing-room walls, and ceiling too for that matter, with the nosegays, and his dining-room with the trellis and the ivy; but if either of our imaginary friends does thus think, let him, in Heaven's name, have his roses and lilies, or his nosegays and ivy, painted with at least a moderate degree of accuracy. We will not be exacting, we will ask only for moderate accuracy, but if he will not meet us to this extent let him not, if we declare him to be one without taste, to be one without a shadow of an idea of the meaning and function of decoration, turn round upon us with the exclamation that we who have severely criticised his dessert-service and his wall-papers are enthusiasts for principles which have no separate existence from our own brain, or (as some who are old enough art-critics to know better have said) that we are mere harmless devotees of line for line's sake.

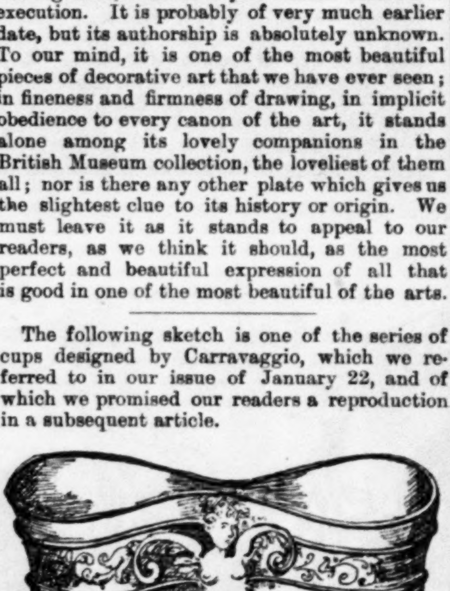
The answer to the question how the structure and general appearance of a natural object is to be conventionalised, as well as its form, seems to depend on the further inquiry, how its structure and appearance are conveyed to the eye? Obviously by means of lines and shadows: the lines we have already dealt with, the shadows alone remain to be considered; these must also be treated in a conventional manner. The method of doing this must depend on the materials used. For work in colour the old missal painters show us how this can be most effectively done: instead of letting the colours gradually deepen from light to dark, they adopted the plan of using three or four distinct shades of the colour, and laying them on separately one on the top of the other, allowed each shade to terminate abruptly in a hard line. Almost any piece of early illuminating will furnish an example of this method, and one or two capital letters in which the stems are treated in this way are to be found in Owen Jones's "Grammar of Ornament" (plate lxxi.—Illuminated MSS.—notably the letter N there given). This method, easy enough with colour, is, of course, inapplicable to engraving, but the best way of dealing in a conventional manner with shading in black and white ornament is to be seen in the two facsimiles given in figs. 1 and 2: practically only the deepest shadows are indicated, the curvature of the foliage being obtained by a very few curved lines springing from the structural base of the object, and shortening as they extend outwards. In this simple way the actual curvature of the leaf is indicated, but without any approach being made to an accurate representation of the real lights and shadows which play upon the leaf in nature: the similitude of an actual plant twined over the surface is nowhere aimed at, but the surface itself on which the ornament is placed is preserved, and is as present to the eye as it was before the ornament was put upon it, though its harsh and unpleasing monotony is broken up with graceful forms.

In an earlier article we have said that most of the engravings which we have sketched to-day might be attributed to a school which might fittingly be called "The School of Gentsch." The two plates undoubtedly his which we gave in our issue of January 15th, are the only ones which bear any known monogram. Those which we give to-day vary considerably in style, and are many of them inferior to his plates, but there is a strong family likeness between them all in the manner in which they are executed, and there can be little doubt that the same influences which impelled his hand impelled also those of the designers of most of the others. Such influences are, within certain limits, eminently local and co-eval. His two charming arabesques, which we have already referred to, point to him either as the master whose spirit the others, the now nameless ones, caught; or as the most successful exponent of the spirit in which they also worked. The small plate which bears a capital V (fig. 4) is in much the same style, and may have come from his hand, unless it be by the same designer as fig. 5. The monogram on this plate is usually read A. S., but this is probably a topsy-turvy reading of V. S. or S. V.; if this be so, the V-plate might also be attributed to the same man with safety, and the monogram could then appear to be S. V. If this should not be correct, the V. S. must not be confounded with the monogram of Virgilius Solis, between whose work (to be noticed in a subsequent article) and this plate there is nothing in common. The V does not give the impression of forming part of an alphabet, though it might, as we have said, possibly be the initial for a book-plate; it certainly looks as though it were the initial of the inventor's name.

The remainder of the sketches will appeal to our readers without any special comment on our part.

The last illustration of to-day's article, the lovely scroll, fig. 6, stands by itself apart from the series of engravings we have just been dealing with, both in style and in method of execution. It is probably of very much earlier date, but its authorship is absolutely unknown. To our mind, it is one of the most beautiful pieces of decorative art that we have ever seen; in fineness and firmness of drawing, in implicit obedience to every canon of the art, it stands alone among its lovely companions in the British Museum collection, the loveliest of them all; nor is there any other plate which gives us the slightest clue to its history or origin. We must leave it as it stands to appeal to our readers, as we think it should, as the most perfect and beautiful expression of all that is good in one of the most beautiful of the arts.

The following sketch is one of the series of cups designed by Carravaggio, which we referred to in our issue of January 22, and of which we promised our readers a reproduction in a subsequent article.



Lifts.—Messrs. Archibald Smith & Stevens have been instructed to supply one of their improved hydraulic lifts for Messrs. Lloyds, Barnetts, & Bosanquet's new bank in Lombard-street. This lift will run through the entire height of the building.

THE METROPOLITAN BOARD OF WORKS AND LONDON THEATRES.

The Bill introduced by the Metropolitan Board of Works for the further regulation of theatres provides that the Board shall every year cause an inspection to be made of all licensed theatres and music-halls, with the exception of such of the latter as contain a superficial area for the accommodation of the public of less than 500 ft., and if the result of such survey is satisfactory the Board shall grant a certificate to the person by whom such theatre or music-hall is kept open.

Certificates under the Act shall be granted not later than the 1st of July in each year, and the Board may, with the approbation of the Home Secretary, fix a charge for the same. In the case of the Board refusing to grant a certificate, the person aggrieved may appeal to the Secretary of State.

No alterations may be made in the structure of any theatre or music-hall without the consent of the Board, and penalties are provided for any infringement of the Act.

Any premises kept open as a theatre or music-hall after the Board has refused to grant a certificate, or a certificate has been cancelled, shall be deemed to be unlicensed, and shall be liable to the penalties attaching thereto.

The Board may serve notice upon the manager of any theatre or music-hall requiring him to comply with any regulations the Board may make with regard to appliances for the extinction of fire, the keeping of the gangways and staircases free from seats, persons standing, and all other form of obstruction, and the provision of oil lamps and candles in theatres and music-halls, and the exit corridors therefrom for use in the event of the extinction of gas.

The Bill was brought in by Sir James M'Ga Hogg, Mr. Tatton Egerton, and Mr. R. Webster, and the second reading is fixed for the 9th of March.

The Bill was framed before the occurrence of the lamentable disaster in Spitalfields, and it is possible that if it had been framed since that event it might have been of a more stringent character. It will be seen at once that as the Bill now stands it will be inoperative as regards the Hebrew Dramatic Club and similar establishments, notwithstanding the Home Secretary's declaration to the contrary in answer to a question by Mr. Isaacson in the House of Commons on the 10th instant, the operation of the Act being confined to licensed premises. The dual control of the Lord Chamberlain and the Metropolitan Board of Works in the case of theatres, and of the Justices and the Board in the case of music-halls, will be continued. The inconvenience of this condition of affairs has been repeatedly pointed out, and calls for a remedy. The simplest plan of dealing with all places of public entertainment would be to make the inspecting authority the licensing authority also, and this might be done by transferring the licensing power from the Lord Chamberlain and the Justices to the Metropolitan Board of Works or the new Municipality for London.

LECTURES ON ARCHITECTURE AT THE ROYAL ACADEMY.

METHODS OF DECORATION AS APPLIED TO ROMAN BUILDINGS.

On the 11th inst. Professor J. H. Middleton, of Cambridge, delivered his second lecture of the present course* to the students of the Royal Academy, taking as his subject, "Roman Houses and their Decoration." In his prefatory remarks he pointed out that subsequently to the early "feudal" period of Greece, there was no age of anything like equal splendour in the decoration of houses until we came to the early years of the Roman Empire. In the most flourishing period of Greek art, architectural splendour was devoted to sacred purposes. Throughout the Republican period of Ancient Rome the same was the case, and as late as the days of Julius Cæsar anything like magnificence in a private house was viewed with extreme jealousy by the Roman people. But fifty years later all was changed. Augustus encouraged the use of marbles, and the erection of splendid buildings of every kind, and in his reign the house of almost every rich citizen began to be decorated in the most costly and elaborate way. One of the characteristics of the houses in Rome itself, beyond those in other parts of the Roman domain, was the magnificent way in which the walls of the rooms and courts were lined with costly foreign marbles and porphyries, of rich and varied colour, brought from countless quarries in Northern Africa, Arabia, Greece, Asia Minor, and other far-distant portions of the Roman Empire. Great skill was shown by the Roman marble-masons in the way they cut and polished not only slabs and columns, but even delicate mouldings in the very hard red porphyry of Egypt, and the green porphyry of Sparta, which a modern marble-mason would declare to be unworkable. The skill of the Romans in this respect appeared to have been derived from Egypt, where the use of the tubular drill set with jewels, such as rubies or corundum, was known as far back as 4,000 years B.C. Marks of such drills, and of saws set with similar jewels, were still to be seen on the hard granites and porphyries used in Rome. By the use of the saws such refractory materials as those referred to were cut with comparative rapidity into slabs of wonderful thinness and evenness. The Romans were always seeking to make the greatest possible display at a given cost, and veneers of the porphyries were found having only a thickness of ⅛ in. There was no known example extant of a Roman room with its decorative marble lining still complete, but the broken fragments which had been found, aided by the impressions of the marble-work on its cement backing, helped us to make out the usual scheme adopted, which, supposing marble to have covered the whole wall, seemed to have had a strong general resemblance to the designs of the wood panellings which were used by Wren, and his pupils and followers in the first half of the last century. There was a dado, with a moulded skirting below it; the skirting was 12 in. or 14 in. high, while the capping of the dado was 3 ft. or 4 ft. above the floor. At the ceiling line there was a deep cornice, the intermediate wall-space being divided into panels. Marbles of various colours were used to strengthen the effect of each line and moulding. Great pains were taken to polish the whole marble surface to the highest possible degree, so that the effect of one of these rooms, with its strong contrasts of vivid colours and reflective brilliance of surface, must have been more magnificent than artistic. In some cases the marble linings were used in a less simple way, series of columns, free or engaged, being ranged along the walls, the intermediate spaces being broken by semicircular niches filled with statues. Having described the way in which the marble linings were affixed to the walls by means of iron or bronze hooked clamps, the lecturer passed on to speak of mosaics, which were largely used for Roman houses, not only for floors, but also for the decoration of walls, vaults, and ceilings. Probably no mosaic now to be seen in Rome dated from an earlier time than the middle or end of the first century B.C. The earliest were those in the Regia, in the so-called house of Livia on the Palatine, and the fragments in the *cella* of the Temple of Castor. These were very different in style from the later mosaics of which so many examples still existed. Simple geometrical designs were used, with scarcely any variety of colour, the pattern being grey on a white ground. The tesseræ were smaller and much more neatly fitted than in the later mosaics. Indeed, as time went on, both the design and the execution of Roman mosaics became steadily coarser, while richer and more varied materials came to be used, until in the reign of Severus, at the end of the second century, mosaics in Rome had become large, gaudy, and devoid of any artistic quality. As the art of the mosaicist declined, and became feebly pictorial,— marble would no longer supply sufficient varieties of colour, and so tesseræ of brilliant glass were introduced, at first mixed with the marble, and then by themselves. These sparkling jewel-like mosaics were mainly used for the decoration of walls and vaults, but sometimes even columns were encrusted with them, producing a startling splendour of effect, such as no other method could surpass. Stucco reliefs were also used by the Romans for the decoration of walls and ceilings. The best of these were by far the most artistic among the methods of decoration used in Rome, the more especially as the finest examples had nothing whatever that was Roman in their design or treatment, but were really pure Greek work, such as would not have disgraced the school of Praxiteles or Scopas. Some of the best of the stucco reliefs in question were made thus:—Four or five coats of stucco were applied to the brick facing of the wall after it had received its usual studding of metal plugs. The first coat was made of coarse *pozzalana* and lime; the next coating was compounded with finely-sifted *pozzalana*; the third coat was of pounded marble; the fourth was of marble in finer particles; and the finishing coat consisted of pure white marble-dust mingled with lime and a little size or fig-tree sap. This set slowly to a surface as hard as marble, and almost like ivory in colour and texture. But before the final coat had set, a sketch in outline of the design was incised with a pointed tool upon the soft surface; the artist then mixed some of the marble-dust stucco into a plastic mass, and applied it in lumps on to the level surface within the sketched outlines. Then rapidly, before it had time to harden, he moulded the work into shape with his fingers and thumb, assisted by a few modelling tools. Very little after-touching seemed to have been needed. The decision and rapidity with which the work was necessarily executed resulted in imparting to these reliefs a vigour and life such as could perhaps never have been given by the slow chiselling of a hard substance. It would be difficult to find any other examples of art which showed so strongly a combined high training of hand and eye. Rapid as must have been the execution of these reliefs, the modelling of the nude showed a very complete knowledge of human anatomy. When they had set hard, the reliefs were coloured, gilt, and silvered, not coarsely all over, but with much skill, so as to increase their decorative effect without vulgarising the figures by any attempt at realistic colouring. Professor Middleton devoted the remainder of his lecture to the subject of mural painting. He said that in Imperial times wall-painting seemed to have been left to an inferior class of house decorators, who, though possessed in some cases of very remarkable technical skill, were not original artists of a high class. We found constant repetitions of the same composition, so closely followed as to show that the wall-painter was not in the habit of producing designs of his own. Moreover, we found a certain equality of merits and defects in the paintings of quite humble houses and Imperial palaces, which would not be the case if it had been the custom for the famous artists of the time to produce wall-pictures. In most cases the great manual skill of the painter was shown rather in the way in which he produced rich and striking effects at a small expenditure of labour than in any serious and carefully-studied excellence either of drawing or finish. In the main, the mural paintings of ancient Rome had the merits and the defects of theatrical scene-painting: they were to be regarded as part of the whole scheme of decoration in each room, and not, as a rule, to be examined for their own sake. Information as to the technical methods of painting used by the Romans was to be found in Vitruvius. The processes used were very varied, and included tempera medium, varnish medium, fresco buono, and encaustic. These were severally described by the lecturer, who referred in conclusion to the Pompeiian wall-paintings.

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* For an abstract of the first lecture, on "Methods of Decoration as applied to Greek Buildings," see last week's *Builder*, p. 248.

METHODS OF DECORATION USED IN ENGLAND DURING THE THIRTEENTH CENTURY.

THIS was the subject of Professor Middleton's third lecture, delivered on Monday evening last. He observed that much had been said and written about the Renaissance of art in Mediæval Italy, but he wished to say something about the very interesting but much neglected subject of the Renaissance in England, —a movement which, on the whole, began earlier than in Italy, was quite independent of it, and during its earlier and most flourishing period produced works of art in many branches, sculpture, painting, and metal-work, which on the whole were superior to anything that the Italian artists of the same time were able to produce. To that statement there was one reservation, and that was with regard to the Pisan sculptor Niccola, who in 1260 carved the great Baptistery pulpit. That wonderful genius, born out of his due time, was a quite exceptional person in Italy, and it was not till some years after the end of the thirteenth century that any of his pupils showed knowledge or skill at all equal to that of their master. Niccola's son Giovanni was far inferior, both in sense of beauty and power of plastic simplicity of design, to our English sculptor William Torell, the London goldsmith, who modelled and cast the beautiful effigies of Henry III. and Queen Eleanor, which still existed in the Confessor's Chapel at Westminster. That wonderful period of English art, during which the artists of England were unrivalled in the world, began with the early part of Henry III.'s long reign of fifty-six years (1216–1272), and lasted in full glory till the beginning of the following century. After that its development was checked, owing to a series of causes, among which the most obvious were the Black Death, which devastated the country more than once during the fourteenth century, and the disturbances and preoccupations of mind which resulted from the Wars of the Roses. Apart from its interest as the birth-time of the new life of art, the thirteenth century was a very momentous one in England, no less than in Italy, for it marked the transition from the old system of feudalism to the modern one of individual rights and liberties. A striking feature of the period was the growth of the various art and trade guilds, which had very important effects both in art and politics. In matters of art the formation of the guilds led to the creation of a secular class of artists, and by degrees took such branches as painting, sculpture, and metal-work out of the hands of the monks, who had previously to some extent monopolised them. The secularising of the artist was a distinct gain, and helped the world to free itself from the dull hieratic formalism of Byzantine tradition, which had for so long prevented any progress towards the growth of a really living art in any branch of work. Any study of the beauties of the human form had hitherto been forbidden to the monkish artist as a snare of the Evil One and a lapse towards the errors of paganism. The secular artist soon threw off such deadening influences, and though for some centuries he continued to work under the influence and mainly in the service of the Christian faith, yet he could not be prevented from pressing sensual beauty,—the true scope of art,—into the service of his nevertheless purely religious painting and sculpture. In another way the art-guilds were of service to the interests of art; they provided for the careful training and long probation of large classes of art-apprentices, and their governing councils were very strict in keeping their members up to a high standard of excellence, both in workmanship and materials used. The painters' guilds, for example, fined the master-painters if their drawing was judged to be faulty, or if they used inferior materials,—such as impure gold or silver leaf, bad flesh-tints, or second-rate azure, and for any carelessness shown in allowing "knots" to show through paintings on panel. One of the chief causes of this brilliant, though brief, period of England's supremacy in art was the enthusiastic way in which Henry III. devoted an unsparing amount, both of time and money, to the production of works of art of all kinds. In all parts of England new palaces were built, and covered with sumptuous paintings. The chief among the many artistic glories of Henry III.'s reign were the creation of the magnificent royal Palace of Westminster, the rebuilding of the greater part of Westminster Abbey Church, and the making of the wonderful gold shrine for the body of Edward the Confessor, the mere inventory of which, by its list of gold reliefs, gold statues set on and around the shrine, and the great sapphires, rubies, antique gems, and other precious stones which studded every part of it, reminded one of a story out of the "Arabian Nights." Of the gold shrine nothing but its imagination-dazzling catalogue now remained. Westminster Abbey, on the other hand, being so well known to his audience, Professor Middleton said he would select for description some of the mural decorations from the Royal Palace at Westminster, some notion of whose splendour might be gleaned from a few fragments saved from the fire in 1834, aided by the very interesting series of accounts which were now preserved in the Record Office, and also by some careful copies by Stothard (lent by the Society of Antiquaries) of the few paintings that survived till the present century in one of the great halls of the palace. No mere painting, however beautiful, could have had the rich decorative effect of the walls of the palace; the very exceptional splendour of the work was produced by a combination of painting and relief, which was practised in England at that period in a much more complete and skilful manner than was ever done in Italy. The walls of the chief halls were lined inside with fine ashlar stonework, over which a very carefully-prepared coat of thin plaster was laid: a fine mixture of gypsum and size, with in some cases a proportion of whitelead, which set with a hard smooth surface, very like the beautiful stucco which was used by the Greeks and Romans, and quite unlike the soft, spongy, rubbishing stuff which was now used for the internal plastering of houses. When the thin layer of plaster was dry, the outlines of the picture were lightly sketched in with a fine brush in red or brown, or else with red chalk. The next step was to apply the ornament in relief, such as diaper backgrounds, rich patterns on the dresses of the figures, crowns, sceptres, brooches, and other ornaments, and especially the main lines of the gables, arches, and other parts of the various buildings which formed the background of many of the pictures. All this ornament in relief was formed by applying a fresh skin or thin layer of the finest stucco in the proper spaces, and by stamping it while soft with very minutely-cut wooden dies or stamps, executed with the delicacy of a cameo or engraved gem. The detail of this ornament was in many places so minute in its richness of design that the full beauty of the pattern could only be made out by a very close inspection. When the stamped reliefs had set hard they were covered usually with thick gold or silver leaf, and then further decoration was added by painting in transparent oil-colours (especially in crimson lake) over the gleaming gold surface of the reliefs. The gold leaf used was very much thicker than modern gold leaf, and was proportionately costly, while the cost of the wall-paintings was materially added to, owing to the necessity of drying the oil-colours with braziers of charcoal, for "driers" were not then known. For this reason, it was only in portions of the pictures that oil-colours were used, the other parts being in tempera. The artists were usually paid a fixed sum for their labour and skill, all materials being found, and very commonly, board and lodging in part of the royal palace. The usual pay of an artisan in Henry III.'s reign was what would now be equal to about 3s. 6d. a day, with board and lodging, or 5s. per day without. The painter was paid at a higher rate. The usual wage for skilful but not distinguished artists was from 6s. to 7s. a day, and that was what the majority of Henry III.'s painters received. A more distinguished artist, like William of Westminster, a Benedictine monk, was paid about 30s. a day; and the architect of Westminster Abbey, Edward Fitz-Otho, had special favour shown to him, besides being paid a very liberal salary. He had a set of rooms in the Palace, and the king granted him a lead pipe the size of a quill to carry water to his rooms from the Palace conduit, — a remarkable favour at a time when it was very rare for secular houses to have water laid on to them, though the richer monasteries were usually well supplied. In conclusion, the lecturer described the Palace of Westminster (the general arrangement of which, he said, was well shown in a drawing* by Mr. H. W. Brewer) and its decorations, and said a few words as to the decorations and artistic objects of the sanctuaries of many thirteenth-century churches, which must, in some cases, have looked rather like museums of valuable curiosities.

Failures in the Building Trade. — According to *Kemp's Mercantile Gazette* the number of failures in England and Wales gazetted during the week ending Saturday, February 12th, was 111. The number in the corresponding week of last week was 85, showing an increase of 26, being a net increase in 1887, to date, of 58. We regret to notice that, on the same authority, the number of failures in the building trades during the week was 17, as against five and nine in the corresponding weeks of 1886 and 1885 respectively.

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* The drawing exhibited by the lecturer was the original of the illustration entitled "Westminster in the Time of Henry VIII." which appeared in the *Builder* for Nov. 15, 1884.

Illustrations.

SKETCHES IN FRANCE.

AN OLD HOUSE AT ROUEN.

IN a small garden just off the Rue Jean d'Arc stands the tower of St. André, and behind this tower, hidden up in a corner, is the front merely of a house which once stood in the Rue Grosse Horloge. Who will venture to say how many modern works have owed some portion of their design to this small building? What a familiar feature is the window in the gable! Be that as it may, there is much that is suggestive in the whole front, and it was a happy thought on the part of its owner thus to preserve it, when circumstances compelled its demolition where it originally stood. It is constructed entirely of wood, and either time has dealt very leniently with it, or it has undergone a most judicious restoration, for the appearance is rather that of a house just built, than of one nearly three centuries old.

CHURCH OF NOTRE DAME DE L'ÉPINE, NEAR CHALONS-SUR-MARNE.

The church of Notre Dame de l'Épine, near Chalons-sur-Marne, which has been declared a "monument historique," possesses two open spires of great beauty,—quite a rarity in this part of France. It is said to have been designed by an English architect, and Fergusson compares it to St. Mary Redcliff. The plan is that of a Latin cross, with nave and choir of nearly equal length, and with boldly projecting transepts,—this latter being certainly an English feature. The church is groined throughout, and the aisle is continued round the apse, which is formed in three cants. The flying buttresses surrounding the choir are sculptured with most comical and amusing grotesques, thoroughly French in their detail, as indeed is the whole building, notwithstanding its English origin. The windows, however, more nearly approach the English Late Decorated in their tracery and general form than any French example, but examination of the mouldings and other details unmistakably proclaim a foreign workmanship; and the curious western portal, surmounted by a great Crucifixion in full relief, is unlike anything to be met with on this side of the Channel. The tower differs slightly in design, the southern being larger and more important than that on the north, which latter has recently been rebuilt. For many years this tower was used as a telegraph station, the spire having been taken down to accommodate it to this novel purpose. Happily, better days have dawned; all signs of posts and signals have vanished, and the church, now in its restored condition, presents a striking contrast to the miserable hamlet in which it stands.

DESIGN FOR A SUBURBAN CHURCH.

This design, prepared by Messrs. Thos. Garratt, of London, and J. C. Carter, of Cardiff, in competition for a large church in the suburbs, where economy was an important condition, shows an attempt to gain effect in the simplest possible manner. It was intended to be built of grey stocks, with red brick dressings, and a sparing use of stone in the windows, strings, &c.

The nave and chancel being of the same width, a large arch is thrown across the transepts in continuation of the nave arcade.

A boarded barrel roof is carried through the nave and chancel at the same height, the former having principals showing, whilst the latter is panelled out with longitudinal and transverse ribs, and a simple wooden vault formed over the crossing.

Externally the nave clearstory is arcaded. The chancel has its clearstory arcaded internally, arranged in connexion with the five-light window at the east end, below which there is space for a large reredos.

The clergy and choir vestries are placed on the north side of the chancel, and an organ-chamber and porch on the south side, the latter to be used as an exit supplementary to the large western porch. The baptistery is at the west end, near the entrance.

The choir seats are arranged so that communicants could return to their seats by the passage behind them.

There is seating accommodation for 831, to which, on special occasions, chairs could be added to a considerable number.

Thos. Garratt.

NEW OFFICES, LEEDS.

These buildings are being erected for the *Yorkshire Post*, a well-known Conservative daily in the north, for the accommodation of the advertising department. The large room on the ground-floor will be fitted up in the most finished style, with furniture from the architect's designs. The walls, and probably the ceilings, will be lined with Burmantofts faïence in colours. The whole of the front externally is of Ruabon red bricks, with terra-cotta dressings. The architects are Messrs. Chorley & Connon, Leeds, and the contractors Messrs. Franks & Evans, of the same town, Messrs. Wilcock & Co. having supplied the terra cotta. The building shown in the view and plan forms only the street front to extensive premises behind, in which are accommodated the printing, editorial, and other departments, all of which have been carried out from the designs of the same architects.

LANTERN TOWER, PERSHORE.

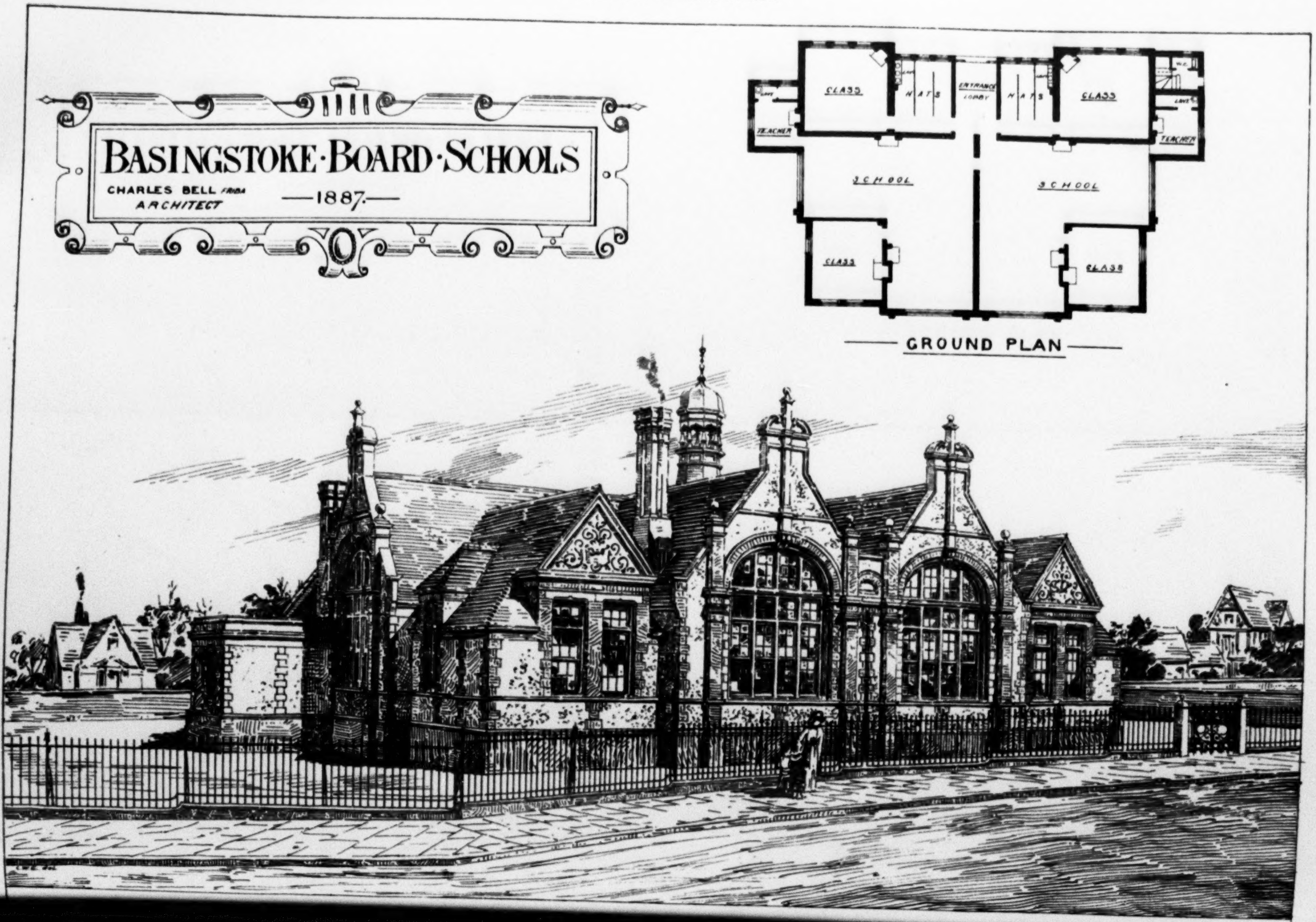
This tower is a remarkably fine example of early fourteenth-century work. It consists of two stages, built on the original Norman arches, the lower stage being open to the church, and the upper forming the belfry. The late Sir G. G. Scott inserted a ringing-gallery in the lantern (omitted in the drawing), which is approached from the upper passage. There is a notable absence of ornament, the ball flowers on the two external strings and on the band of panels of the lantern inside being the only carving in the work. The upper portions of the pinnacles are restorations. This drawing was one of those for which a certificate of honour was awarded in connexion with the Pugin studentship this year.

BASINGSTOKE BOARD SCHOOLS.

The foundation stones of these schools were laid in November last by the Chairman of the Board (Mr. G. Dunn) and Major May, the Mayor of the Town.

The schools are planned in three departments,—the boys and girls in one building, and the infants in another. They accommodate respectively 900 and 400; total, 1,300. The site is over one acre in extent, and occupies an elevated position, with frontages on three sides to roads. The boys' and girls' schools have each a central hall, with class-rooms opening out of it for sixty children. The infants have all their rooms on one floor, and the sexes are divided equally. The playgrounds are spacious, and with a sunny aspect, with sheds on one side. The schools are built of red local brick, with flint facings above the plinth line. The roofs are tiled. The large school will be heated by hot water, and ventilated on an improved system,—a shaft for this purpose being provided 70 ft. high. The infant school will have open fires. The architect is Mr. Charles Bell, F.R.I.B.A., of Dashwood House, London; the builder, Mr. Goodall, of Basingstoke; and the clerk of works, Mr. G. W. Berry. The contract is 10,351*l.*, and it is expected the works will be completed in the autumn.

Surveyors' and Auctioneers' Clerks' Provident Association.—The third annual meeting of this Association was held on Saturday last at the registered office, the Auction Mart, Tokenhouse-yard, Mr. G. Haines (Messrs. H. Haines & Son) presiding. The report and financial statement (to which reference was made in the *Builder* three weeks ago, p. 205) for the past year were agreed to and adopted, and the officers re-elected for the current year. The chairman said it was a matter for congratution that the Association was in a successful position, financially, though he regretted the number of members was not considerably larger. He hoped all interested would do their best to extend the usefulness of the Association, which was established for the objects of granting allowances to members in sickness, life assurance, and superannuation. A vote of thanks to the annual subscribers was passed, and also to the chairman for presiding.


BASINGSTOKE·BOARD·SCHOOLS
CHARLES BELL FRIBA
ARCHITECT
—1887—
CLASS
HATS
ENTRANCE
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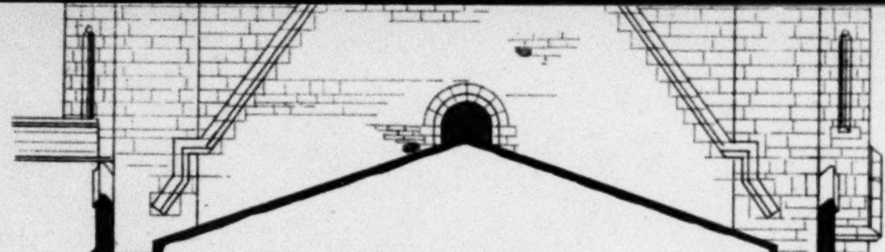
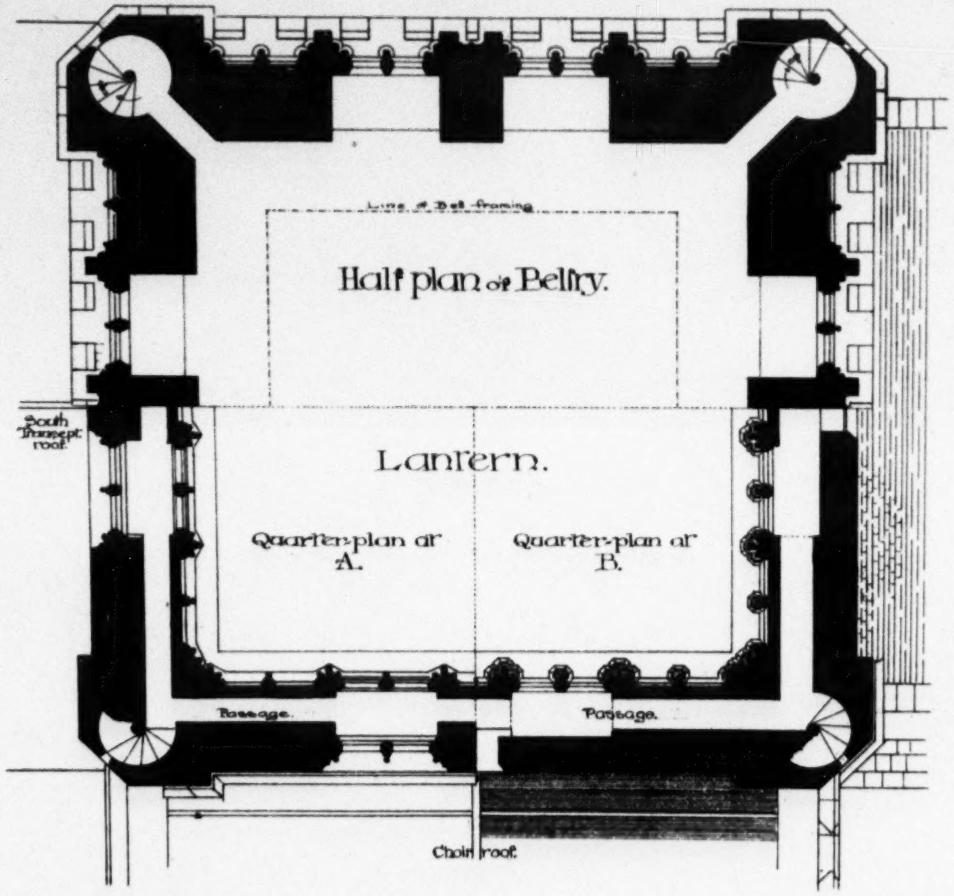
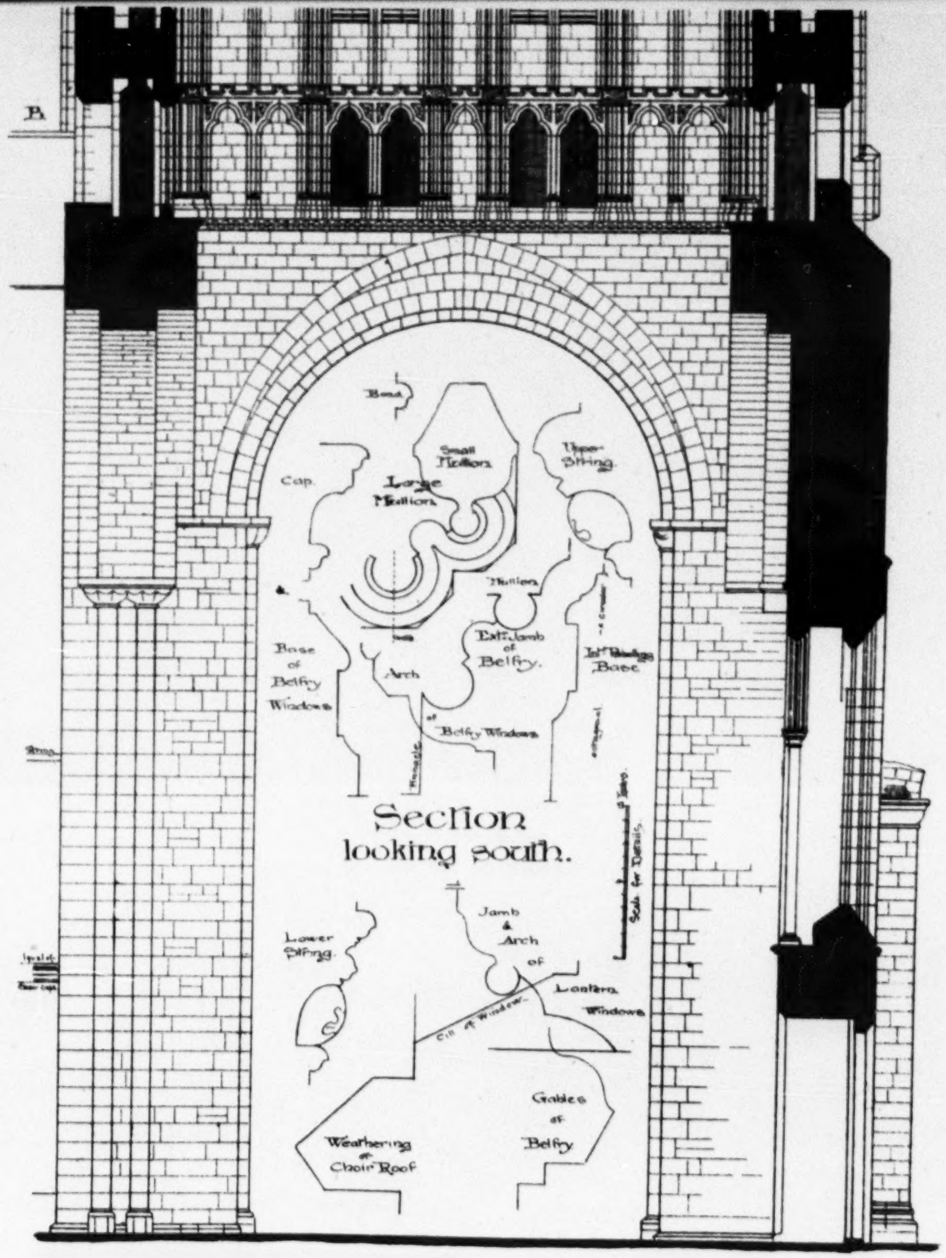
SCHOOL
CLASS
CLASS
GROUND PLAN



East Elevation.


Line of Bell framing
Half plan of Belfry.
Lantern.
Quarter-plan at A.
Quarter-plan at B.
South Transept roof
Passage.
Passage.
Choir roof.

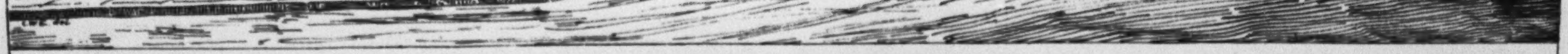

B.
Bead
Small Mullion
Upper String.
Cap.
Large Mullion
Mullion
Base of Belfry Windows
Arch
Ext. Jamb of Belfry.
Int. Bridge Base
of Belfry Windows
Section looking south.
Scale for Details.
Lower String.
Jamb & Arch of
Lantern Windows
Cill of Window
Gables of Belfry
Weathering of Choir Roof

Scale.

C.F. Kell Photo-Lith & Printer.

8, Furnival St Holborn, London, E.C.

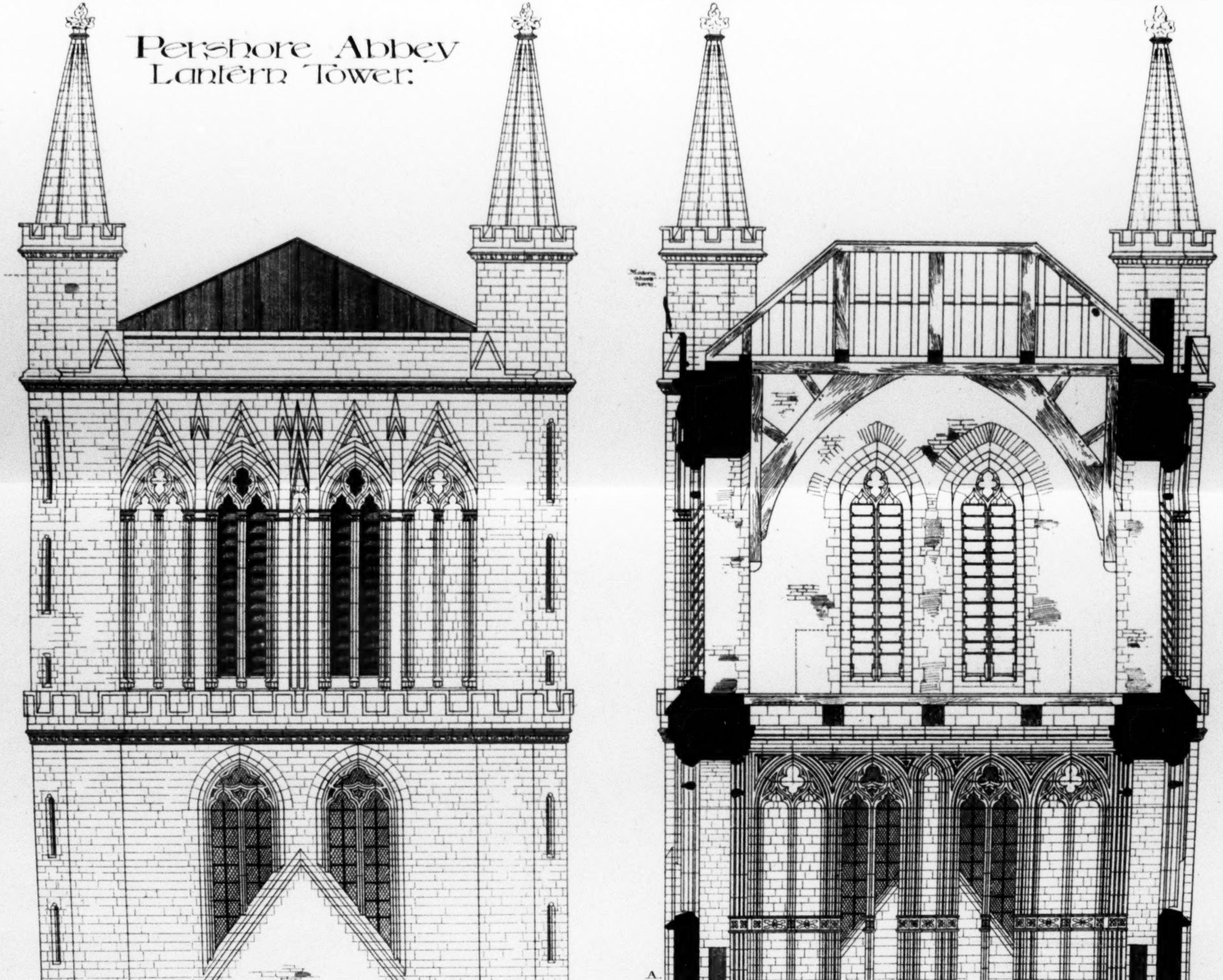
PUGIN STUDENTSHIP COMPETITION 1887.

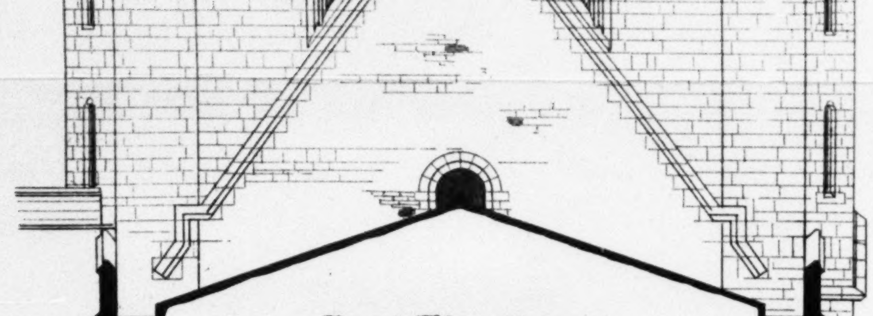


—INFANTS —SCHOOL—

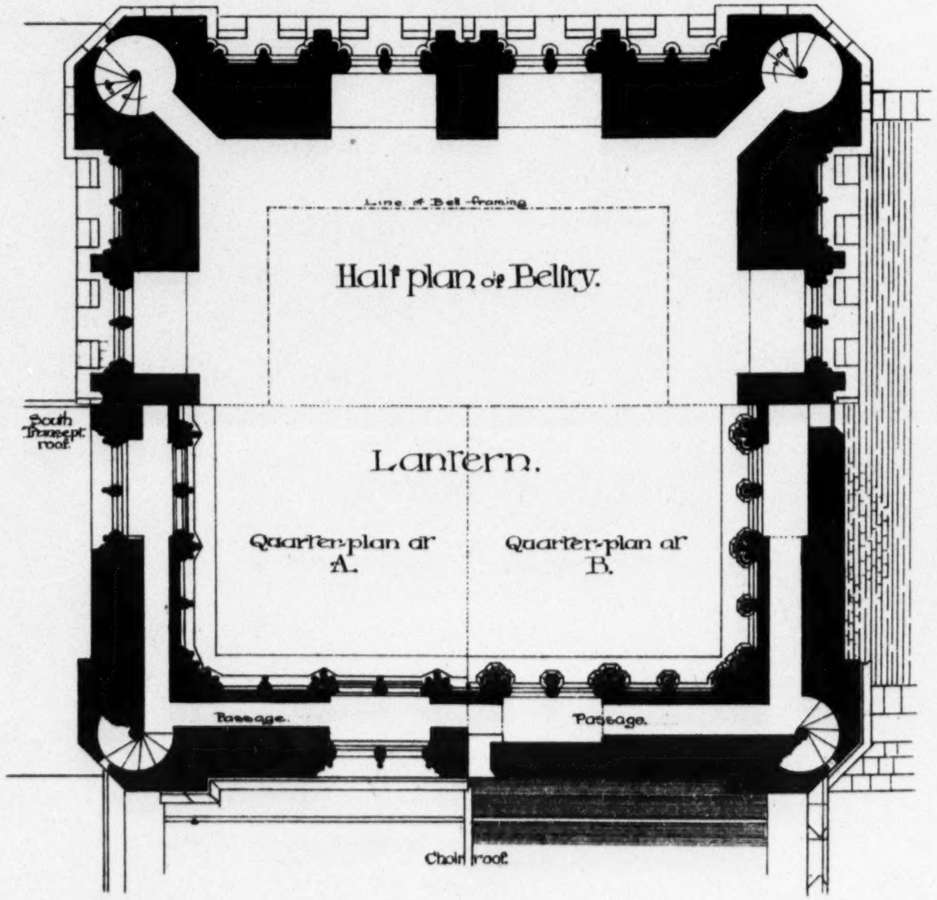
C.F. Kell Photo-Lith & Printer 8, Furnival St. Holborn, London, E.C.

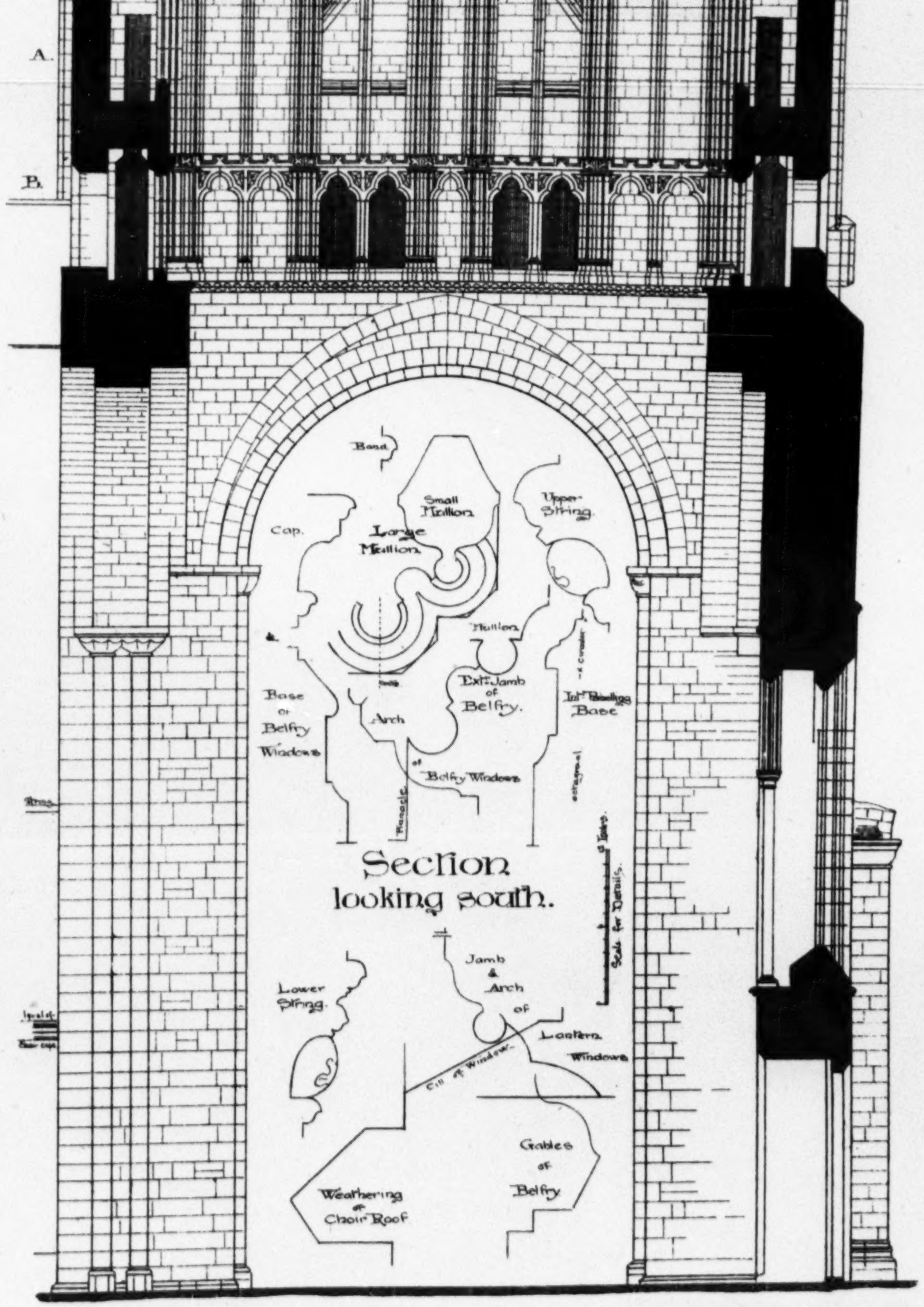
Pershore Abbey Lantern Tower.


Modern above here
A.



East Elevation


Line of Bell-framing
Half plan of Belfry.
South Transept roof
Lantern.
Quarter-plan at A.
Quarter-plan at B.
Passage.
Passage.
Choir roof.


A.
B.
Band
Small Mullion
Upper String.
Cap.
Large Mullion
Mullion
Ext. Jamb of Belfry.
Base of Belfry Windows
Arch
of Belfry Windows
Int. Base
Scale for Details.
Lower String.
Jamb & Arch of Lantern Windows
Cill of Window
Gables of Belfry
Weathering of Choir Roof

Section looking south.

10
20
30
40
50 Feet.

Scale.

C.F. Kell Photo-Lith & Printer

8 Furnival St Holborn. London, E.C.

PUGIN STUDENTSHIP COMPETITION 1887.

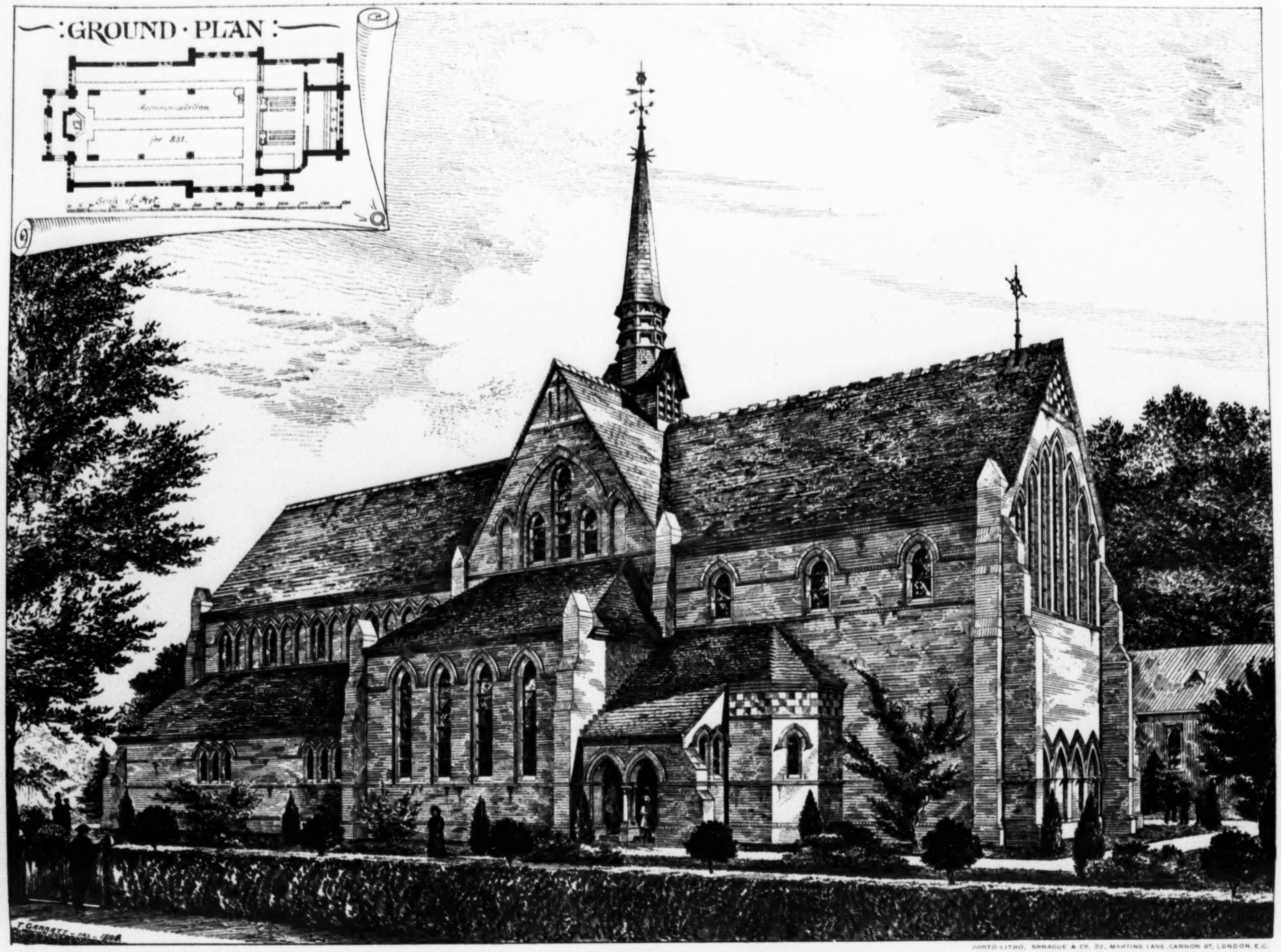
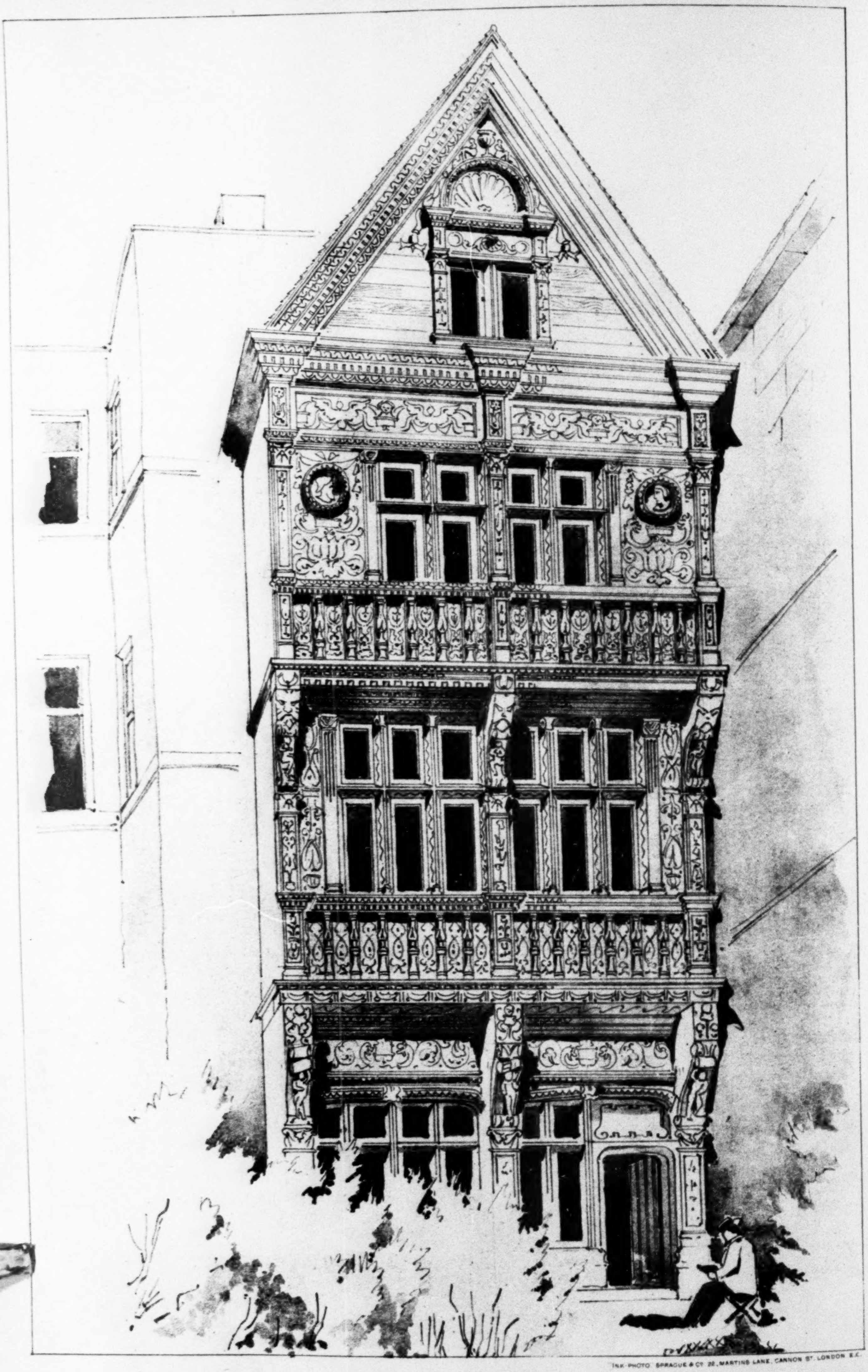

:GROUND · PLAN:
Accommodation
for 831.
Scale of Feet
0 5 10 20 30 40 50 60 70 80 90 100 110 120 130
T. Garratt — del — 1886

PHOTO-LITHO, SPRAGUE & Cº, 22, MARTINS LANE, CANNON Sᵀ, LONDON, E.C.

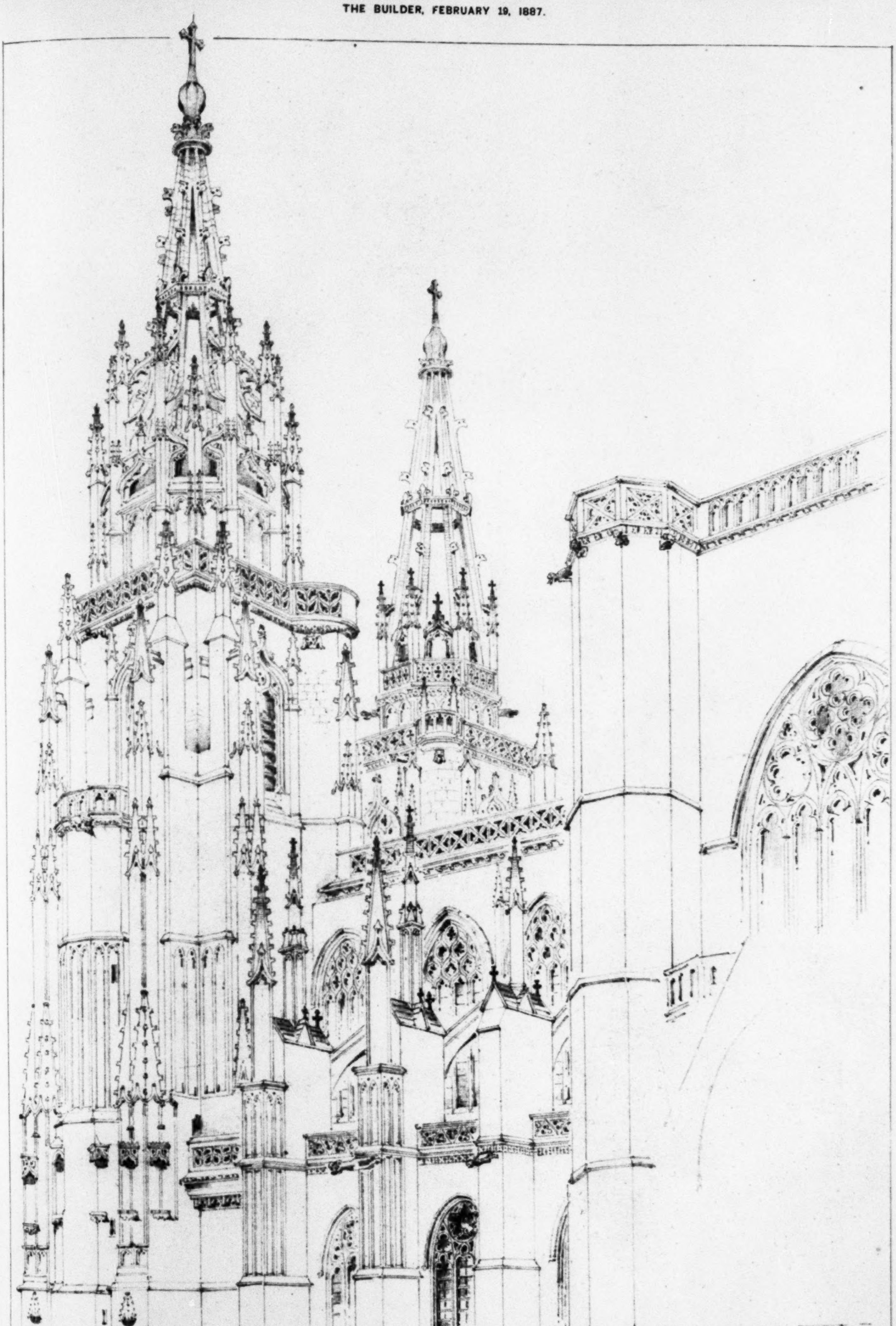
DESIGN FOR A SUBURBAN CHURCH: by Messrs T. Garratt, A.R.I.B.A., and J. C. Carter



INK-PHOTO SPRAGUE & Co 22, MARTINS LANE, CANNON St. LONDON E.C.

OLD HOUSES, RUE de la GROSSE HORLOGE, ROUEN.—From a Sketch by Mr. Arnold B. Mitchell, A.R.I.B.A.

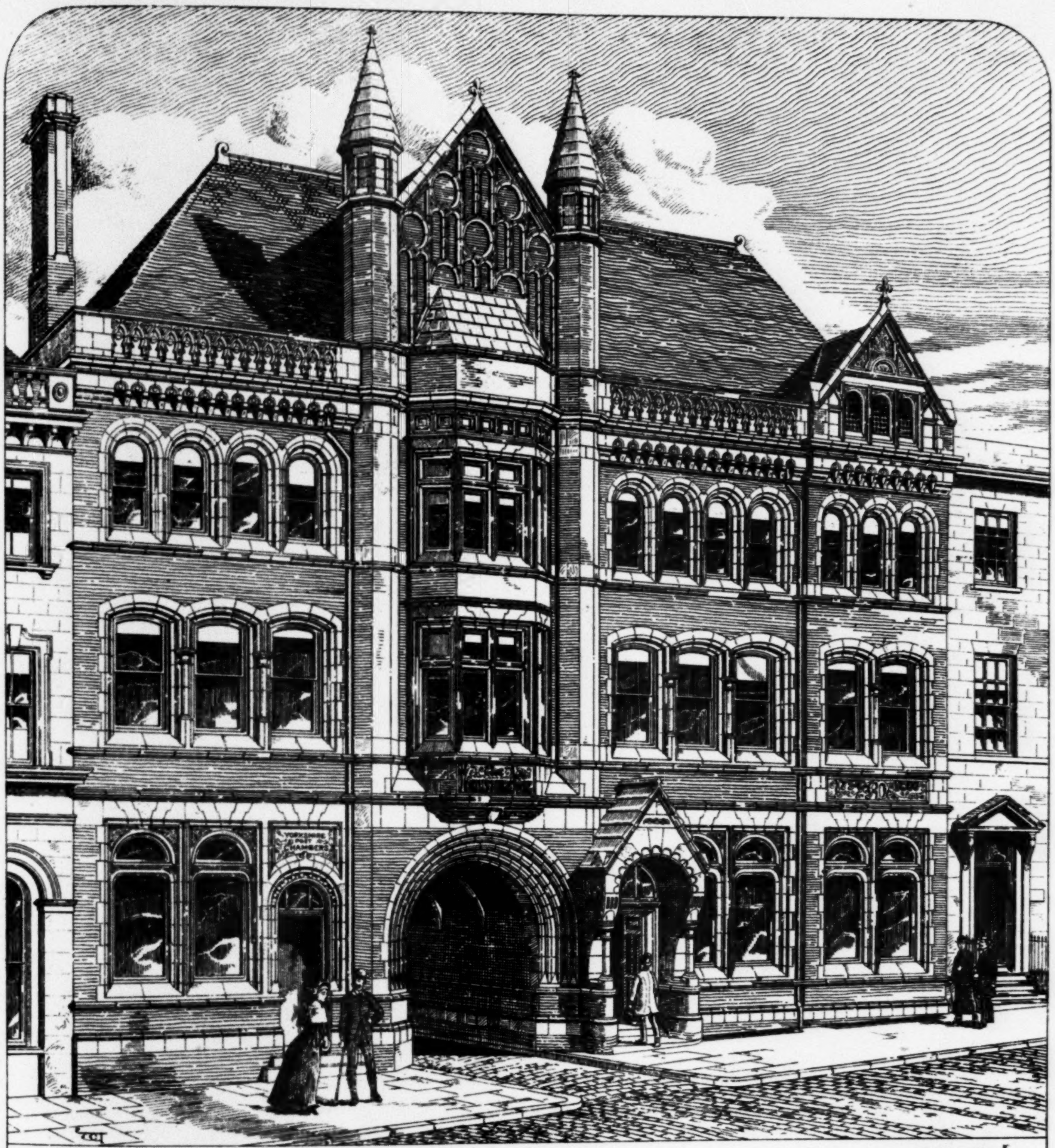
Pugin Studentship Competition, 1887.



"INK-PHOTO." SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

CHURCH OF NOTRE DAME DE L'EPINE, NEAR CHALONS SUR MARNE.—FROM A SKETCH BY MR. ARNOLD B. MITCHELL, A.R.I.B.A.

Pugin Studentship Competition, 1887.


YORKSHIRE POST & CHAMBERS

THE

YORKSHIRE POST.

PROPOSED NEW OFFICES

LEEDS.

MESSRS. CHORLEY & CONNON. ARCHITECTS.

Scale of Feet

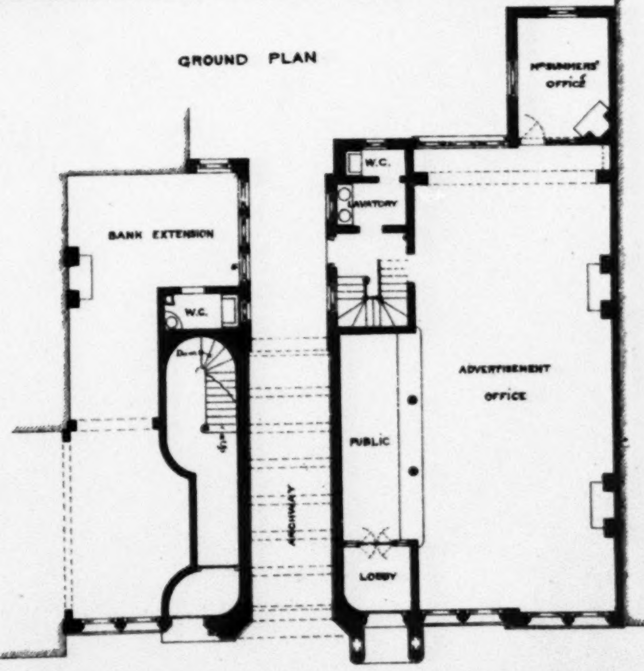

GROUND PLAN
MR. SUMMERS' OFFICE
W.C.
LAVATORY
BANK EXTENSION
W.C.
ADVERTISEMENT OFFICE
PUBLIC
ARCHWAY
LOBBY

PHOTO-LITHO. SPRAGUE & CO. 22, MARTINS LANE CANNON ST. LONDON, E.C.

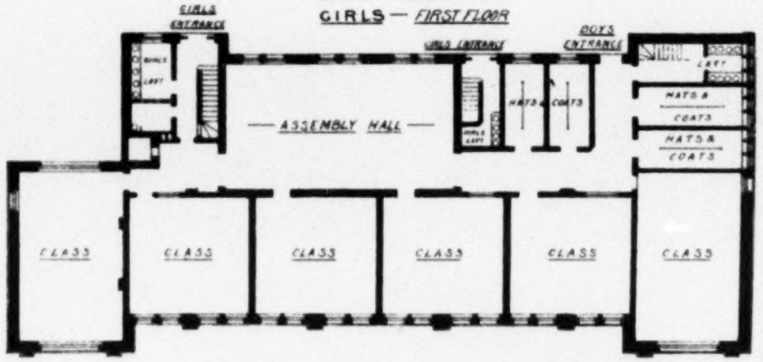
BASINGSTOKE · BOARD · SCHOOLS

CHARLES BELL FRIBA
ARCHITECT

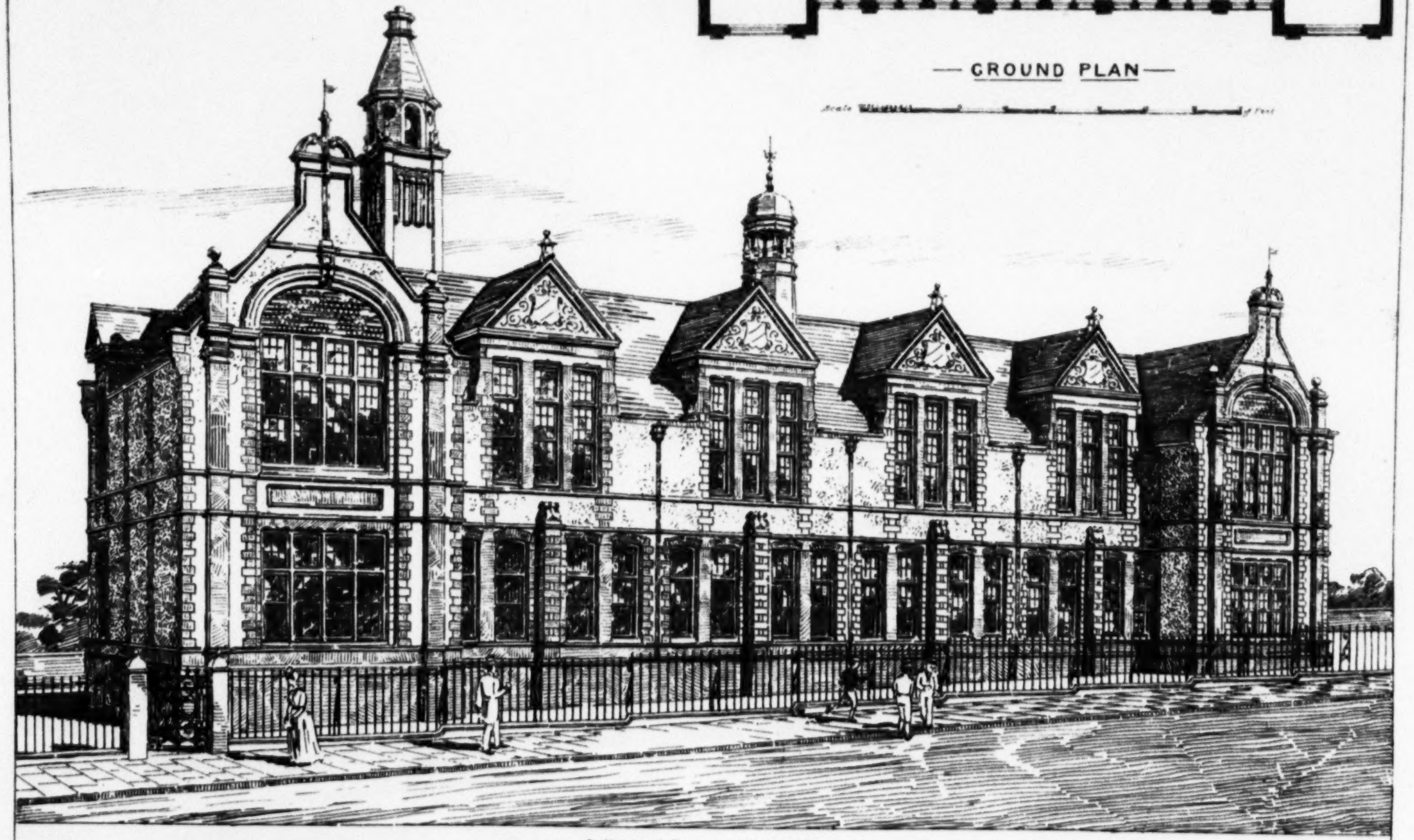
—1887—

—SENIOR SCHOOL—

BOYS — *GROUND FLOOR*
GIRLS — *FIRST FLOOR*


GIRLS ENTRANCE
GIRLS LAVY
GIRLS ENTRANCE
BOYS ENTRANCE
LAVY
ASSEMBLY HALL
GIRLS LAVY
HATS & COATS
HATS & COATS
HATS & COATS
CLASS
CLASS
CLASS
CLASS
CLASS
CLASS
Scale of Feet

—GROUND PLAN—



——SENIOR—SCHOOL——

C F Kell Photo Lith & Printer 8, Furnival St. Holborn, London, E.C.

THE EDINBURGH MUNICIPAL BUILDINGS COMPETITION.

THE exhibition of the designs sent in in this competition was opened on Monday, but we defer a detailed notice of them until next week. The designs will remain on view for three weeks longer.

The Edinburgh papers state that Mr. Waterhouse has provisionally approved of the six designs bearing the following mottoes, viz.:—"Edina Classica" (estimated cost 98,000*l.*), "Fortuna" (125,000*l.*), "In my Defence" (102,000*l.*), "Light and Air" (75,000*l.*), "Nineteenth Century" (120,000*l.*), and "Ora et Labora" (280,000*l.*). It will be seen that there is a wide margin of cost between the estimated cost of the last-named design and the one marked "Light and Air."

The *Scotsman* gives the following list of the other designs submitted, with the estimated cost of each, viz.,—"Fiat," 125,000*l.*, "Kathleen Mavourneen," 130,000*l.*; "N.D.I.V.," 120,000*l.*; "Rathhaus," 170,000*l.*; "Virtus in Arduis," 98,011*l.*; "Olympus," 150,564*l.* 6s.; "Am Freiceadan Dubh," 127,500*l.*; "Iona," 100,000*l.*; "Line upon Line," 102,000*l.*; "Crevecour," 66,000*l.*; "Golden Star," 135,000*l.*, including 4,000*l.* for statuary; "Waverley," 110,000*l.*; "St. Giles" (1) 170,000*l.*, "Quien Sabe," 151,000*l.*; "Si. Monumentum Requiris," 140,000*l.*; "Excipere Laboravi," 132,800*l.*; "Fora," 128,000*l.*; "Scotia," 120,000*l.*; "Municipalis," 165,000*l.*; "The Heart of Midlothian," 80,000*l.*; "Dora," 160,000*l.*; "St. Giles" (2), 190,000*l.*; "Ravenscraig," 90,268*l.*; "Res Publica," 116,560*l.*; "Fors," 178,000*l.*; "Rex," 112,000*l.*; "Finis Coronat Opus," 137,258*l.*; "Tanma," 150,000*l.*; "Civis," 141,618*l.*; "Edina, Scotia's Darling Seat," 149,245*l.*; "Waverley," 112,200*l.*; "Edina," 79,580*l.*; "Baronial," 80,000*l.*; "City Cross," 126,400*l.*; "Tannahill," 135,700*l.*; "Warriston" (1), 115,000*l.*; "Aiblins," 118,000*l.*; "Dignity and Simplicity," 135,000*l.*; "St. Andrew," 120,741*l.*; "In My Defence," 161,352*l.*; "Warristoun" (2), 120,000*l.*; "Orion," 150,000*l.*; "Experience," 150,000*l.*; "Rob Roy," 145,791*l.*; "For Queen and Country," 150,000*l.*; "Heriot," 121,537*l.*; "Jubilate," 95,000*l.*; "Omega," in cypher, 130,000; "Quadrangle," 82,000*l.*

The *Scotsman* of Thursday says it is understood that Mr. Waterhouse, R.A., has given his decision, and that the Lord Provost on Wednesday received the assessor's report. The Sub-Committee on the Plans, as also the Lord Provost's Committee and the Town Council were to meet on Thursday, when it was expected that the contents of the report would be communicated to them. "Light and Air," "Edina Classica," "Nineteenth Century," and "Fortuna" were generally spoken of as the likely designs to which the awards would be given.

By the courtesy of the Editor of the *Scotsman*, we learn by telegraph (just as we go to press) that the following are Mr. Waterhouse's awards:—

First, "Edina Classica," author, Leeming, Westminster.

Second, "Nineteenth Century," author, Stark, Vincent-street, Glasgow.

Third, "In My Defence," (with heraldic device), author, Simpson & Allen, Strand.

Birmingham Architectural Association.—The seventh ordinary meeting of the current session was held at Queen's College on Tuesday evening, February 15th. The Vice-President, Mr. John Cotton, was in the chair. Mr. E. F. Tibley was elected a member of the Association. Mr. E. Westwood was nominated for membership. A paper was read by Mr. E. R. Taylor (Head Master of the School of Art), entitled "Servants of Architecture." The lecturer pointed out the necessity of all architectural students studying the art of modelling in clay in addition to the various branches of freehand drawing. A hearty vote of thanks was proposed by Mr. W. Doubleday, and supported by Messrs. W. H. Bidlake, T. Timmins, J. Cotton, and Victor Scruton (Hon. Sec.). After a response from Mr. Taylor the meeting terminated.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

THE sixth ordinary meeting of this Institute for the present session was held on Monday evening last, Mr. Alfred Waterhouse, R.A. (Vice-President), in the chair, in the absence of the President in Italy.

Obituary.

Mr. W. H. White (Secretary) announced the death of Mr. T. H. Sapsford, the City Architect of Sydney, New South Wales. Mr. Sapsford was only elected a Fellow at the last meeting of the Institute, and the letter announcing his decease was received two days after the notice of election had been posted.

The Royal Gold Medal.

The Chairman.—This being the meeting at which the proposal by the Council as to the Royal Gold Medal is announced, I will call upon the Hon. Secretary to read By-law 76, which affects the question.

Mr. Macvicar Anderson (Hon. Secretary) read the by-law.

The Chairman.—In accordance with that by-law, I beg to announce that the Council propose that the name of Mr. Ewan Christian, past-President, be submitted to her Majesty as that of a fitting recipient of this year's Royal Gold Medal. (Applause.)

A Member.—Mr. President, I do not know whether I am out of order, but I cannot help expressing my feeling that a very worthy man has been passed over.

The Chairman.—I am afraid you are out of order. We cannot discuss the question to-night.

In reference to a complaint made that Mr. Ewan Christian had been prematurely mentioned in a Liverpool paper as the Council's intended nominee for the Medal,

The Chairman remarked that the subject had been discussed at the Council that afternoon, and deep regret had been expressed by every member present that such a thing should have occurred.

Mr. H. Dawson considered that something more than a mere expression of regret was called for. This was a betrayal of trust quite unworthy of any gentleman.

Mr. Macvicar Anderson took the same view as Mr. Dawson, but the difficulty was to find the individual who ought to be censured.

Mr. Ralph Nevill thought that would make it all the easier to pass an expression of censure.

The Chairman added that a considerable amount of indignation was expressed at the Council meeting, and he did not believe the thing would occur again.

The matter then dropped.

The Imperial Institute.

Mr. Macvicar Anderson, the hon. secretary, next read a communication from Sir Frederick Abel, on behalf of the Prince of Wales, inviting the co-operation and subscriptions of the members in favour of the Imperial Institute. The Council had, therefore, ordered the communication to be read before the members, and to be published in the Journal of Proceedings.

The Liverpool Cathedral Designs.

A Member drew attention to the statement in the public press as to a certain memorial which had been circulated among some members of the profession in regard to the Liverpool Cathedral competition. It was desirable that it should be stated officially whether the Institute had put its hand to this thing or not, because it seemed a very dangerous precedent.

The Chairman replied that the committee in question had not yet reported to the Council on the subject. But that the Council had had the question forced upon its consideration, was evident from the fact that they had passed a resolution which would now be read.

Mr. Macvicar Anderson.—The resolution that the Chairman has referred to, which was passed this afternoon by the Council, is as follows:—

> "Resolved, that a letter be addressed to the *Builder** and certain other newspapers, stating that the modified circular referring to the Liverpool Cathedral competition, which appeared in their last week's issue, has in no sense been approved by the Council or the Competitions Committee of the Royal Institute of British Architects; and further, the Council feel very strongly that nothing should be done, by exhibition or otherwise, to upset an award conscientiously arrived at by a professional assessor."

Mr. Macvicar Anderson added that it was his opinion that the circular was one which should not have been issued. He threw it in the waste-paper basket when he received it, on the broad ground that the Liverpool Competition had been conducted in accordance with the recommendation that the Royal Institute of British Architects had promulgated, that no competition should be conducted without a professional assessor being appointed. He thought that for any members of the Institute to take such action as had been taken by the memorialists was simply an effort to make the Institute eat its own words.

Professor Kerr said he had signed the memorial merely because it seemed a courteous and business-like request to those in charge of this important national competition to allow the drawings to be exhibited in London.

Mr. J. P. Seddon remarked that he was rather in a difficulty because he had been out of town, and had not been able to see Mr. Scott, who had, however, written to say that he had modified the thing. He (Mr. Seddon) had not seen it until it had appeared in print,* therefore he was rather in a difficulty as to making any explanation of the matter. He was ready, however, to support everything he had said in connexion with it.

Mr. Henry Currey, as the chairman of the Competitions Committee, said that the amended memorial had not been submitted to the committee.

Mr. Seddon added that he would not let the memorial go in until it had been again sent to the members who had signed it, giving any one liberty to withdraw. For his own part, he thought the whole action of the Competitions Committee most undesirable for the profession (laughter). Therefore, he maintained what he had done, but would withdraw it until each member who signed it knew exactly what he had signed for.

The Chairman said the members must be obliged to Mr. Currey and Mr. Seddon for their explanations, and they would at the same time feel that the Council had expressed itself strongly and fully in the matter.

Notes on Greek Architecture.

Professor T. Hayter Lewis, F.S.A., then read a paper entitled "Notes made during Tours in Greece, 1881 and 1884." The Professor, after referring to his first visit to Greece in 1842, described what he saw there in 1881 and 1884. As the greater part of what had been uncovered had been admirably illustrated by the Society of Dilettanti and the Greek and German archæologists, the Professor restricted himself to a general description, supplementing this with details of any of the remains which are more specially interesting to architects, and illustrated his remarks by means of diagram drawings. He said that at Menidi, near Athens, is a remarkable circular tomb, of the bee-hive form so well known in Western Europe, 27 ft. in diameter and 28 ft. high. The courses of stone are built, *not* radiating, but having horizontal beds, as have all the other buildings of the same type known to the Professor. The most remarkable feature of this tomb is the peculiar construction of the masonry over the entrance doorway, which closely resembles that employed by the builders of the king's chamber of the Great Pyramid. The Professor confessed that he did not quite understand the principle on which these successive lintels were erected, but thought that the intention may have been that, if the top one were broken, its two pieces would tilt down and be stopped by the next lintel, and, if that were broken, by the next one, the stonework above being wedged together into a solid mass as it followed the lintel. Two drawings of tombs, found in the old Athenian cemetery,—the Cerameicus,—were then referred to, and a third tomb, built of rough stones, having just the appearance of a dolmen, was more particularly described. The tomb contains two chambers, side by side, with a third cross-wise at the end. The total size is 9 ft. by 6 ft. Few discoveries of importance, as compared with those at Eleusis and other places, have been made at Athens; and, as such as there are would probably shortly be described by Mr. Penrose, the Professor passed on to describe the group of buildings at Eleusis. The building first reached from the village is the little temple of Diana Propylæa. This measures about 24 ft. by 16 ft. internally, and only the foundations and pavement now remain. Its dimensions confirm the theory of proportions so ably worked out by Mr. Watkiss Lloyd for Professor Cockerell. Beyond this temple is the Propylæum, built entirely of Pentelic marble, nearly as a copy of the centre part of that at Athens. Beyond this, again, is the gateway, called the inner vestibule, which gives access to the remains of the Temple of Ceres. There are scarcely any ancient descriptions of this building, owing to the dread entertained of incurring the anger of the deity by revealing any of its secrets. It is about 170 ft. square, exclusive of the portico. It was built on the side of a steep hill, and, quite exceptionally, the angles, not the sides, of the building, face the four cardinal points of the compass. The date of the erection and the architect of the temple are matters of doubt. The portico, which may be considered apart from the main building, is, there can be little doubt, purely Greek in design and execution. The Professor thought it might be possible to reconcile the conflicting statements as to the architect of the *cella*, and that so celebrated an architect as Ictinus might have given the design, as consulting architect; the execution of the work itself being placed in the hands of Coræbus and Metagenes. The late Mr. Fergusson supposed that the centre part of the building was originally left quite open, without the row of columns shown on the Professor's plan; and produced a most ingenious restoration, based on the meagre statements which we have from ancient writers. The Professor thought that this restoration must be accepted as the nearest yet suggested to the original design; but we were still left in doubt as to the mode of covering the central portion. All translators agree that Xenocles of Cholargus roofed, or domed, or arched, or completed in some way, the top; each employing a different word, and arriving at different results, according to his interpretation of the word ἐπαιον. The question is how was the work done? It might have been, the Professor thought, that the central portion had originally been left open, as suggested by Mr. Fergusson, and that Xenocles afterwards covered over the open space in a manner similar to that employed in the Egyptian halls, but with sloping instead of flat roofs. But in attempting to discover the reason for the glowing descriptions of this temple, given by various ancient authors, the Professor was led to suspect that this cell might not be Greek at all, but a rebuilding by the Romans: a suspicion supported by historical references and by Mr. Penrose, who describes the columns as being late Roman. The result, then, of all these excavations appears to be that the original form of this temple is still as much a mystery as the Eleusinian mysteries themselves, for the celebration of which the building was designed. After passing Corinth, Mycenæ, Argos, and Tiryns, the Professor had visited Epidaurus, and he described the Theatre and, later on, the Tholos, when describing that at Olympia. The theatre is of gigantic proportions, and is especially interesting in that it is purely Greek throughout. Its general plan is the ordinary Greek one, but with some peculiarities as to orchestra and stage. Usually the orchestra was much lower than either the front seats or the stage, so that there was a high podium before the seats, and a high proscenium to the stage. At Epidaurus, however, the whole is level, with the singular exception of a wide trench or surface drain passing half round the orchestra in front of the seats. Nearly all the seats remain, but are a good deal misplaced, owing to the giving way of the ground under. The Professor could find no traces of the great masts or other supports that must have been used if the theatre had ever been covered by a velarium; nor of any covered gallery or portico, though remains of an enclosing wall were shown on his plan. It is quite clear, he stated, that there must have been some such protection, yet in the shape of a high wall the echo would, he thought, be very great. There may, perhaps, have been a high curtain or velum to prevent the actors' voices being carried away by a high wind. He had examined the seats to see if they sloped at different angles as they receded from the position occupied by the actor, and found that such is the case to a limited extent in this theatre, as also in one or two other Greek theatres referred to. But he had been unsuccessful in endeavouring to find any acoustic vases disposed between the seats in the manner described by Mr. Gordon Hills, who cites various authors to show that such vases, or the cavities containing them, have actually been found in several Greek theatres. The Temple at Bassæ, built in a commanding position, is in ruins, but some of the columns are erect, and are carefully watched by the Athenian Archæological Society. The external columns were Doric, the internal Ionic, with one solitary column in the centre Corinthian. The architect was Ictinus, and the date of the building therefore was *circa* 440 B.C., *i.e.*, some forty years before Callimachus, who, according to Vitruvius, invented the Corinthian order. The temple runs north and south, not east and west, as is usual; and there is the unusual feature of a side entrance. The internal columns are not detached, as elsewhere, but are united by buttresses to the walls. Surely Ictinus was too good an architect, the Professor remarked, to do this without a reason! If so, what was his special reason? It could not have been the support of cross-beams of marble, as usual in flat ceilings, as there was nothing out of the common way to support. Pausanias, in describing this example, says,—"A temple of Apollo, the roof of which is of stone. This temple would stand first of all the temples of the Peloponnesus, except that of Tegea, for the beauty of the stone and the neatness of the structure." This reference to the roof clearly refers to some peculiarity in its structure, and has led to a very interesting controversy. It had occurred to several architects that possibly the arched canopies to statues found on several Greek coins were real representations of the forms of the roofs under which they were placed. This theory has been worked out by Mr. E. Falkener, and his drawings, showing his proposed restoration, are very graceful. The Professor showed drawings of several of these coins. In conjunction with his son, he had made a careful search throughout the mass of fallen stones, in order, if possible, to find anything to solve this problem, and showed drawings of two stones found by him, splayed to a form of abutment; but he was unable to assign any definite position to either, and was doubtful as to whether the splay of one of them might not have been an accidental fracture. The Professor then described the excavations at Olympia, and showed a diagram plan,—a copy of the German plan,—which shows the state of the ruins as he saw them in 1884. The Temple of Juno is an object of great curiosity to an architect, on account of the difference in size and proportions of its columns, of which it has the unusual number of sixteen at the sides to only six in front. There are, the Professor said, many other edifices of great interest in and about the Altis, but he must content himself with noticing one other only, viz., the Tholos, west of the *Heræum*, known as the Philippeium. It is thus described by Pausanias:—"A round building, on the top of which is a brazen poppy, as a clamp for the beams. It is built of baked brick, and there are some pillars round it." The general impression, supported by Freeman and Fergusson, appears to have been that such circular buildings were unknown to the Greeks. But we now have the Tholos at Elis, and another more curious at Epidaurus, — this round building having the hitherto unknown range of columns internally. Of the Tholos of Elis, nothing remains *in situ* but the foundations; but these are perfect, giving the general dimensions 49 ft. 6 in. in diameter, measured on the bottom step, the interior diameter of the *cella* being 24 ft. 8 in. in the clear. The Professor had carefully examined and measured the fragments scattered about, and with the help of the German restoration had succeeded in making out the greater part, and showed diagrams representing the building as restored by him. The fragments found enabled him to easily restore the peristyle and its ceiling, but the restoration of the *cella* presented a more difficult task. The most valuable fragment found was one which shows distinctly that the interior was decorated by a row of semi-engaged columns, said to have been Corinthian. The German drawings show nine of these, but the Professor thought that if there had been ten of them the present remains would fit in, and there would not be a column directly in front of the door. The Germans also have restored the roof with a kind of clearstory,—a restoration with which the Professor hardly agreed. He had reason to think that the architect of this building, and of the Tholos at Epidaurus, lived in the fourth century. If so, these buildings, and that of Lysicrates, would all be of the same date. The Professor's notes were, he said, but a summary of the result of the patient labour and research of others, and showed how many problems had still to be worked out in considering the architecture of the Greeks. This could best be done in the bright clear air of Greece, and the school at Athens, with Mr. Penrose at its head, was a boon to all, especially to those who might be fortunate enough to pursue their studies on the spot.

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* The letter referred to, as well as one on behalf of the Competitions Committee of the Institute, will be found on p. 301 of this number.

* See *Builder*, p. 266, *ante*.

In the discussion which followed,

Mr. W. Watkiss Lloyd said he had felt much pleasure in going through the drawings with Professor Hayter Lewis, and there was a great deal undoubtedly that could be said and written about them. He would first of all notice that the circular building excavated by the Athenians, and which had been alluded to, was mentioned by Pausanias as having been built by Polycletus, the great sculptor, to whom also the architecture of the theatre was due. He (the speaker) was particularly interested in the temple at Eleusis. That building was in direct contrast to any other Greek temple, having been evidently planned to accommodate a large concourse of people, which was not the case in Greek temples generally. The Greek temple was distinctly a *naos*, or dwelling-place for the statue of the god or goddess, and was not intended to accommodate large congregations, but for sacred ceremonies. The building at Eleusis, however, was distinctly the Telesterion —a great hall where the Eleusinian mysteries were celebrated. The seats all round the building evidently indicated that purpose, but it was a great relief to him when Professor Hayter Lewis demonstrated so clearly that the columns were not part of the original plan, for it was exceedingly difficult to explain how an assemblage of people could have taken part in any common ceremony if there was so much of what was now called "clerical eclipse" produced by a forest of columns. The general outline of the celebrations was known. The chief ceremony was performed on moonless nights, and a great and imposing effect was produced by the sudden transition from intense darkness to brilliant illumination. Besides that, a regular sacred drama was performed, with a good deal of singing and considerable movement of the congregation, each individual taking part in the ceremony, which, according to the ancient descriptions, was very much like what could now be seen in the Levant at Easter. The object of a large, square capacious building was to give a very considerable area for these celebrations, and to enable the Athenians to take individual and collective part in them. He had not quite lost hope that with the progress of investigation traces might still be found of the original bases of some of the supports. For, although the celebration took place on moonless nights, and, consequently, in the dark, he could not but suppose that a considerable part of the building must have been covered, especially from the use of the word *opaion*. He could not understand how any one could explain this, except as a distinct opening, but how it was managed he could not tell. For the information of those who cared to take further interest in the subject, he might say that in the recent edition of the "Encyclopædia Britannica" there was an article on the Mysteries, admirably written, and very satisfactory taken in conjunction with the architecture. That site might be said to be the most sacred of antiquity, the celebrations practised there being of a more imposing, and, he might almost say, of a more religious, character than any other celebrations which the Hellenic religion comprised. The entire genius of the Greeks was apparently bestowed in rendering them as impressive as possible. Æschylus himself was a native of the Eleusinian district, and is said to have designed the costumes for the celebrations. When it was considered how, in the passage from pagan to Christian ceremonies, there was so great a tendency to graft the old ceremonies on the new, he had a strong conviction that the copes, chasubles, and other vestments used by the clergy at the present day were largely derived from the imagination of Æschylus, that great master of scenic effect. Professor Hayter Lewis had been good enough to refer to what he (the speaker) had done with respect to the little Temple of Diana, one of the most remarkable examples of the application of proportion to architecture by the Greeks. Looking back to his old studies on the subject, made some thirty years ago, he had found a note which recalled the difficulty he had experienced in one part in finding what the principle was on which it had been planned and designed. It came right in every other respect, and at last he found the dimensions on the margin of Stuart's drawing did not correspond with the geometrical plan; when he corrected that he found everything to be right.

Professor Kerr proposed a vote of thanks to Professor Hayter Lewis, and expressed the pleasure it gave the members to see him that evening. It reminded him of old times. He was delighted to find that Professor Hayter Lewis had still leisure to pursue the most exalted studies of the profession. They would all agree that what had been so modestly laid before them that evening had been of the greatest æsthetic and archæological value. Professor Hayter Lewis was a credit to the profession, and long might he continue to be so.

Mr. Charles Fowler seconded the resolution, and remarked that part of the pleasure of listening to their old friend was to observe the youthfulness, freshness, and vigour with which from time to time he put some interesting matter before the members.

The Chairman added that it was much to be regretted that the hour was so late. He was sure that other members would have wished to join in the discussion, and say something about the Professor's paper. Indeed, he himself would have liked to ask some questions, but he refrained from doing so on account of the lateness of the hour.

The vote of thanks was then put and carried by acclamation.

Professor Hayter Lewis replied, and expressed the pleasure it had afforded him to meet the members again.

The Chairman then announced the adjournment of the meeting to the 28th inst., when a paper will be read by Mr. Josiah Conder, on "The Architecture of Japan." Mr. Conder, he added, was now in England, and had an immense collection of drawings with him.

WILLESDEN NEW PUBLIC OFFICES COMPETITION.

The Willesden Local Board have received fifty-four sets of drawings in reply to their invitation to architects to send them designs for new offices to be erected in the Dyne-road, at the corner of Dunster Gardens, and just off the Kilburn high road. A large proportion of the competitors have succeeded in producing thoroughly practical working plans, and a good many of the designs have also a reasonable amount of architectural beauty, so that, although the two are not always in combination, the committee should have no difficulty in finding twelve sets of drawings to submit to a professional arbitrator (which is, we hear, what they propose to do), all of them representing buildings which would perfectly answer their purpose, except, perhaps, as regards the cost. The sum of 6,000*l.* allowed, and which is to cover boundary walls and all incidental expenses, including the architect's commission, is really too small if anything in the shape of architecture worthy of a public building is expected, and, although a few of the designs could no doubt be carried out for the money, that result has only been attained by a too evident economy and the smallest possible use of any architectural features.

No. 53, "Favete Linguis," is one of those that combine the charms of good architecture with a convenient and sensible plan. The drawings show a symmetrical Classical building of red brick and stone, with high-pitched green slate roofs; the centre portion, two stories high, with the large windows of the board-room in the upper part, surmounted by a stone dormer, and the roof crowned with a simple but well-designed lantern; the wings, projecting in front of the centre block, and being only one story high, complete a pleasing group. The entrance to the building is in the centre, and opens to a small hall, with the grand staircase beyond; the offices of the surveyor and his subordinates are to the left hand, where they get the north light, and those connected with the clerk's department are on the right, together with the larger committee-room and the collector's office. On the upper floor the board-room occupies the whole of the front, and the back part is taken up with the smaller committee-room, the waiting-room, and a large cloak-room, &c., for the use of members of the Board. The drawings are spirited and neat, and do justice to one of the best designs in the collection.

Opposite to this set, as the designs were arranged in the Brondesbury Hall, was hung another very good one, No. 11, under the motto "Plan." This design is similar in conception and general disposition to No. 53, but great pains have been taken to keep it within the limit of cost. The elevations show a plain red brick and stone building, well grouped, but comparatively bare of architectural adornment, which is, indeed, almost wholly confined to a couple of plain stone cornices, some coupled brick pilasters between the windows of the first floor, and a simple lantern on the main roof. The general arrangement of the plan is similar to that of "Favete Linguis," but both committee-rooms are placed on the first floor and there is less lavatory accommodation. "Plus," No. 45, puts the clerk's offices on the upper floor and one committee-room, with the waiting-room, on the ground-floor to the right of the entrance, which is not so good an arrangement as that before described; otherwise the plan is a good one and the architecture above the average.

"Bonâ Fide," No. 7, is another somewhat similar design, illustrated by a very taking perspective drawing. The mistake has been made of putting the surveyor's offices to the right of the entrance or on the south side of the building, and a large stone porch and other expensive features are shown; but in other respects the building would be a convenient as well as a dignified one.

"Pro Bono Publico" is a good design of Jacobean character, with a good working plan, but expensive.

"Plan," No. 10, the second with this motto, has good Flemish Renaissance elevations, but the plan is straggling.

"Apex" is a good specimen of an unsymmetrical design, which would produce a convenient building of a rather less ambitious type than most of the others.

"Nemesis" is a little too much like a private house. "Art" is a very good design indeed, but the entrance is rather awkwardly placed. "Dunster" is not done justice to by a poor set of drawings.

We noticed also "Forward," "Jubilee," "X. Y. Z.," "Brick," "St. Augustine," "Utile Dulci," "Per Ardua," Triangle in circle, and "Quod Petis hic est."

THE ARCHITECTURAL ASSOCIATION.

VISIT TO A NEW CHURCH AT WIMBLEDON.

The first Saturday afternoon visit of the Architectural Association for the present session was made on Saturday, the 12th inst., to the Roman Catholic Church of the Sacred Heart, Dalston-road, Wimbledon. The party of members was received by Mr. T. A. Walters, the architect.

The church is situated on a very sloping site, and at present only the nave is being built. The character of the work is Decorated, of a Lincolnshire type. The nave is 26 ft. 6 in. wide, and upwards of 50 ft. high. The aisles when built will be 16 ft. wide. Over alternate piers in the nave arcade are richly-carved niches, which will be filled with statues, and the aisle roof will be carried with pierced stone principals. It is proposed to brick up the chancel arch for the present, but a large decorated rood will be fixed in the opening at once. The internal stonework is executed in Beer stone, and the walls are to be plastered and decorated. The roof will be of stained deal, with decorated bosses. The external stonework is Ancaster, and the facing knapped flints. The internal effect of the church, even in its present incomplete condition, is very effective, and when completed it will be a very interesting specimen of modern church architecture.

Friern Barnet Sewerage Works.—The sewers in the above district, which have been constructed under the direction of Mr. Baldwin Latham, C.E., of Westminster, and comprise outfall sewers, "of which nearly four miles have been laid in tunnel at depths varying from 20 ft. to 70 ft.," have just been completed by Messrs. B. Cooke & Co., of Battersea, the contract sum being 23,000*l.*

THE LIVERPOOL CATHEDRAL COMPETITION.

Sir,—In the *Builder* of last week [p. 266] there appeared a letter, signed by Mr. J. Oldrid Scott and Mr. John P. Seddon, and headed "Liverpool Cathedral Memorial," stating that, at the suggestion of the Committee on Competitions of the Royal Institute of British Architects, the proposed memorial would be modified, and giving the terms of the new circular as modified.

This was laid before the Council of the Royal Institute, at their meeting on Monday, the 14th inst., when the subject of the proposed memorial and of the recent Liverpool Cathedral Competition was for the first time brought before them. We are consequently to ask you to allow us to state in your columns that the modified circular referred to has in no sense been approved by the Council or by our Competitions Committee; and that the Council feel very strongly that nothing should be done, by exhibition or otherwise, to upset an award conscientiously arrived at by a professional assessor in any architectural competition.

J. Macvicar Anderson, Hon. Secretary.
William H. White, Secretary.
Royal Institute of British Architects,
Feb. 16.

Sir,—As the wording (no doubt unintentionally) of Messrs. Scott and Seddon's letter in your last week's issue has led many to think that the modified memorial had been approved by the Competitions Committee, allow me to state that this is in no way the case. Mr. Cole A. Adams being away unwell, I was deputed to see Mr. Scott by the Committee, and point out to him the portions to which exception was most strongly taken, which I did, and heard no more of it till the modified memorial appeared in your paper, without its ever having been before the Competitions Committee at all.

An exhibition of the drawings may or may not be desirable in London, but if entertained for the purpose of upsetting the assessor's award, would, I am certain, be strenuously opposed by the Competitions Committee.

Aston Webb.
19, *Queen Anne's Gate*, Feb. 17.

THE PROPOSED IMPERIAL INSTITUTE COMPETITION.

Sir,—I take the Imperial Institute to mean, 1st, a building (such as is suggested) to be erected by the contributions from all parts of the empire; to be 2ndly, consolidated into a useful repository for products and manufactures the results of the industries of the British Empire. Surely, if this is right, the competition ought to mark the Jubilee year with a lead in the higher direction in competitions, by making it wide in its scope, embracing every architectural student, offering substantial premiums (and many of them), that the result may be truly Imperial, worthy of the committee in charge, the people from whom it has sprung, and the architect who shall create the successful design.

February 16th, 1887. Liverpudlian.

SANITARY INSTITUTE OF GREAT BRITAIN EXAMINATIONS.

Sir,—With Mr. W. H. Colbran [see his letter, p. 201, *ante*], I was greatly astonished at the unprovoked attack made by your correspondent, Mr. Scott (p. 164), upon the Sanitary Institute, and I regret that he, himself a member of the Association of Municipal and Sanitary Engineers and Surveyors, could discover no better method of advocating the cause of that Association than by traducing the Sanitary Institute. His statements concerning the Institute are of so inaccurate a nature that I am again, and finally, induced to address you on the subject.

With regard to Mr. Scott's assertion that but few Local Authorities have even so much as heard of the existence of the Sanitary Institute, I may state that the Institute has, by special invitation of the respective Local Authorities, held successful Annual Congresses at various towns (including Leamington, Exeter, Croydon, Stafford, Newcastle, Leicester, Dublin, and Glasgow), attended by distinguished scientists, engineers, neighbouring and other local sanitary surveyors, medical men, and the public generally. By reason of the valuable papers there read and the discussions based thereupon, as also by the exhibition of sanitary apparatus and appliances and the awards of "diplomas" in connexion with meritorious sanitary inventions (adjudicated upon by some of the most able men of the day), these congresses have been the means of enormously advancing the popular interest in, and knowledge of, sanitary science. (Over 40,000 persons visited the Sanitary Apparatus Exhibition of the last Congress.)

I am also told that I attach too much importance to the Sanitary Institute certificates in supposing they influence local authorities. Within late years it has, however, not been rare for a local authority in advertising for a surveyor or inspector of nuisances to specifically state that "other things being equal, preference will be given to a gentleman holding the Certificate of the Sanitary Institute." Did space permit I could produce abundant evidence to prove beyond doubt that not only do these certificates carry great weight, but that they afford a degree of security to a local authority in its choice of a surveyor far above such as is obtainable from ordinary testimonials.

Conducted by experts and men of great distinction, these examinations, owing to their difficult nature, are to all except real workers but as sour grapes. That they, nevertheless, have attained considerable popularity is indicated by the fact that nearly 200 Nuisance Inspectors' and over 40 Local Surveyors' Certificates have been awarded to gentlemen residing in every part of Great Britain, not to mention about 200 failures, amongst which I trust no members of the Association of Municipal and Sanitary Engineers and Surveyors are numbered. In view of these Examinations being held only in the metropolis, their voluntary nature, and the fee attached thereto, also of the fact that surveyorships change hands but slowly, Mr. Scott's statement that a dozen Local Surveyors hold certificates is further evidence of popularity.

Feb. 16. J. A. A.

⁂ The concluding portion of our correspondent's letter is not strictly relevant to the question, and is therefore omitted by us.

"HOUSE AGENTS."

Sir,—You would not willingly allow your columns to be the means of doing injustice to any class, and I therefore hope that you will admit a few words of comment on the article in your issue of the 12th instant on the subject of House Agents.

You think that the principal function of the agent is to bring the proposed purchaser and vendor together, and that for all further purposes the business would be better completed were he "eliminated from the proceedings." Now, of course, there are, as in most other callings, "agents *and* agents," but it is certain that this is utterly inapplicable to the case of offices of standing and reputation. In their case I venture to assert that their work subsequently to the introduction of the property to the notice of the tenant or purchaser is frequently of much more value and importance than the introduction itself. That clients are of this opinion is evinced by the frequency with which, after receiving a proposal themselves, they bring the business to the agent, that he may carry it out.

One of the most patent mistakes in your article is the assumption that the carrying out of the negotiation by the agent increases the expense to both parties. The agent is paid by a commission on the amount, payable if he does no more than find the tenant or purchaser, so that it is of no advantage to him that negotiations are prolonged; on the contrary, it involves expenditure of time and trouble without corresponding remuneration. You are very angry with agents for not promoting personal communication between principals. Now, an owner will often employ an agent precisely because he does not desire these "personal communications," which involve trouble and, of course, often lead to no result. Moreover, intending tenants and purchasers will not unfrequently adopt your happy idea of "eliminating the agent," or, as they sometimes express it, "preferring a personal interview with the owner"; and this simply because they consider they may be able to drive a better bargain personally with an owner who may be less shrewd and "wide-awake" than themselves,—perhaps a lady inexperienced in business, an elderly gentleman, or an invalid. The agent is here only doing his duty in standing between his client and the sharp man of the world.

I have nothing to say of the supposed practice of agents misleading their clients as to prospects of disposal of their property and amount of inquiries, except that the practice does not exist in reputable offices. As to the agent maintaining high prices and preventing a settlement on lower terms, it is clear that if he looked only at his immediate profits it would be his interest to do just the reverse. He would let or sell twice as many properties if he were able and willing to offer them below their market value, and it is obvious that the commission on two sales at 1,500*l.* each would be better than one at 2,000*l.* Hence, when he advises a client, as he often has to do, to stand out for the higher price or rent, he is entitled to the credit of doing his duty to his employer, against his own immediate interest, and certainly does not deserve the somewhat hasty and ill-considered censures of the writer of the article. Edward Chesterton.

Kensington, Feb. 14, 1887.

⁂ As to the last matter, we will offer one experience as typical. A house was offered by an agent for a certain rent; agent expressing himself willing, however, to submit an offer 10 per cent. lower. Customer declined this, but, finding out who the owner was (*not* from the agent), offered him 20 per cent. less, which was accepted with an alacrity which showed even that less would have been taken. The premium, again is in many cases, a mere farce, held up in the hope that some one will be green enough to take it *au sérieux*, and really serving only to frighten away offers.

"MASONS' WAGES."

Sir,—When perusing your valuable paper I was very much surprised at the suggestion made by your correspondent "G. C. W.," viz., that the masons' alleged grievances in London should be settled or alleviated by the master builders being persuaded to have their stone worked in London instead of at the quarries.

Why should an employer pay a quarter as much more by so doing than by having the stone worked at the quarries, to satisfy the whims or grievances (?) of men who (so far as my observation as a large employer of masons extends) would profess a grievance after every demand was supplied? To the best of my judgment all these "grievances" are known only to "Society" men, and were they not sought out and shown to them by others who are apparently paid for so doing, and have nothing else to do, my impression is they would never be known.

I do not hold with paying men less than their worth (nor more), and I feel sure every employer of labour will bear me out by stating that a different rate of wages should exist, so that indifferent, ill-tutored, careless, slow, or (more frequently) intemperate, and consequently unreliable and irregular men, should not be paid the same price as a constant, quick, good, reliable man. It is no encouragement for such to maintain his ability, or for the inferior to endeavour to better his powers, and so attain an increase of wages *pro rata*.

Now, reverting to "G. C. W.'s" remark about stone being worked at the quarries, the very statement he mentions as to the "builders taking contracts, then sub-letting the masonry to a sub-contracting mason, and the latter again letting it to be worked at the quarries," proves that stone can be, and is, worked cheaper there than anywhere, and consequently should be, and is, on the increase; and if the masons are grieved about it, let them come down to the quarries and work there, although, for my part, I would rather the "Society" men kept away.

In conclusion, if masters and men were only left alone more it would be better for them; and then, if the masters found good men, and the men good masters, they would work well together; and the bad, on the other side (masters and men), might also be left alone, and allowed to progress as best they could. A Quarry Owner.

WASTE WATERS FOR FLUSHING PURPOSES.

Sir,—Will some of your readers kindly give their experience in using waste-water from kitchens, sculleries, &c., for flushing water-closets?

I believe some such an arrangement is in existence in some towns, and saves much expense in cost of fittings, water, &c. Health.

The Student's Column.

FIELD WORK AND INSTRUMENTS.—VIII.

Surveying Instruments.

VIII.—THE CIRCUMFERENTOR.

THE circumferentor is an instrument principally intended for subterranean surveying, but is also useful for completing the survey of any thickly-wooded portion of a country, where it is found difficult to connect the direction of any particular base line with the adjacent portion of the work. In its simple form it constitutes a miner's dial, consisting of a circular box containing a very sensitive magnetic needle, mounted upon a stand with folding sight-vanes, which are raised perpendicular to the compass-box. In each vane there are slots and holes, one over the other, a fine line of silk, horsehair, or wire being strained down the centre of each slot, in a similar manner to the sight-vane of a prismatic compass, and the circular holes are each crossed by lines at right angles to one another, the intersection of which is used in ranging the opposite sight-vane in line with a distant station. These sight-vanes are alternate, the aperture serving as an eye-piece in the one, being exactly opposite the aperture by which the centre of an object is ranged in the other. With this instrument the direction of the roads and workings of a mine, or of a stream through a wood, may be roughly determined by a comparison with the magnetic meridian. In the prismatic compass the needle was seen to be attached to the card upon which the degrees of a circle were graduated. In the circumferentor the needle revolves upon its bearing in the centre of the dial, and the divisions are marked upon the compass-box, as shown in fig. 2, which represents a plan of the instrument with the sight-vanes raised ready for use, as in fig. 1. In fig. 5 the instrument is shown closed with a cover over the compass-box and the sight-vanes folded down for the convenience of packing. The needle in fig. 2 is released to play freely by pulling out the stop-piece marked M. Fig. 3, which represents a plan of the underneath portion of the instrument, shows the position of this stop-piece with reference to the set-screw H, which clamps the instrument to its stand.

The fixed divisions upon the dial in the compass-box are marked very distinctly upon a raised circular rim, which forms the outer edge of the silvered plate, marked A, in the centre of which the needle is carried. These divisions are engraved consecutively to 360°, in a contrary direction to the figures upon the face of a watch, and are usually cut upon both the outer and the inner edges of the face of this rim, with the figures indicating the degrees placed in order in a circle between them, as shown in fig. 2. Upon the inner portion of this plate, the letter N. denotes the north, coincident with the line marked 360° upon the graduated rim, and the letter S., immediately opposite, denotes the south point upon the dial coincident with the line marked 180°. The plate over which the needle travels is further divided within the raised rim by cross lines at right angles to one another into four parts, each quadrant being semi-divided, and containing subdivisions reading from zero at the points marked N. and S., advancing in tens of degrees to 90° at the points marked E. and W. The inner circle of divisions upon the raised rim enables us to read to degrees the angle of intersection at the centre of the compass-box, between the direction of the needle pointing to the magnetic north over the line marked N. and S. upon the dial, and the line ranged by the sight-vanes, while the addition of the vernier,—an enlarged view of which is given in fig. 6,—enables us to record angles within three minutes, or one-twentieth of a degree.

The compass-box is connected with an exterior gimbal ring, the latter carrying the arms, upon the ends of which the sight-vanes D, D, are attached. The best instruments have spirit levels, B and C, fixed at right angles to one another upon these arms. The vernier is fixed to the inner edge of the box which holds the compass, its zero point being placed in the same vertical plane as the centre line of the sight-vanes, and in a line at right angles to the axis of the gimbal ring. A circular rack and pinion, worked by the milled screw, K, shown in fig. 3, communicates to the vernier plate an absolute horizontal motion round the outer circular rim of the dial-plate. By means of this rack-and-pinion movement, great steadiness of action is obtained. The gimbal ring carrying the sight-vanes can be fixed rigidly to the compass-box, by means of the turn stops, L L, as shown in figs. 1 and 3, or inclined, as shown in fig. 4, when required to suit the declivity of a heading or tunnel. In fig. 4 it will be observed that the turn stops, L L, are unclamped by reversing. With the use of an arc marked F, which can be attached by the screw E, or removed at pleasure, the gradient of a heading may be measured, while the compass-box remains level, and records the magnetic bearing. Two scales of graduations are engraved upon this arc, one indicating the degrees of a circle between zero and 45°, while the other scale gives the corresponding values of the versines of the angles registered, these amounting to 1·52 in 100 for an angle of 10°, 6·02 in 100 for 20°, 13·4 in 100 for 30°, 23·4 in 100 for 40°, and 29·29 in 100 for 45°.

The compass-box is commonly mounted upon a ball-and-socket tripod, fitted with a turned and bored ferrule-joint. In this respect it differs from the screwed head shown in the illustration of a ball-and-socket tripod stand, which accompanied our description of the prismatic compass. In mining work it is found convenient to have the legs of the tripod jointed in the centre, as low headings often occur. When the legs are required to be shortened to suit the headway, three pegs each, similar to the one marked P in the diagram, are supplied in the box, for screwing on to the middle portion of each leg.

In order to find the bearing of a line by the

THE CIRCUMFERENTOR

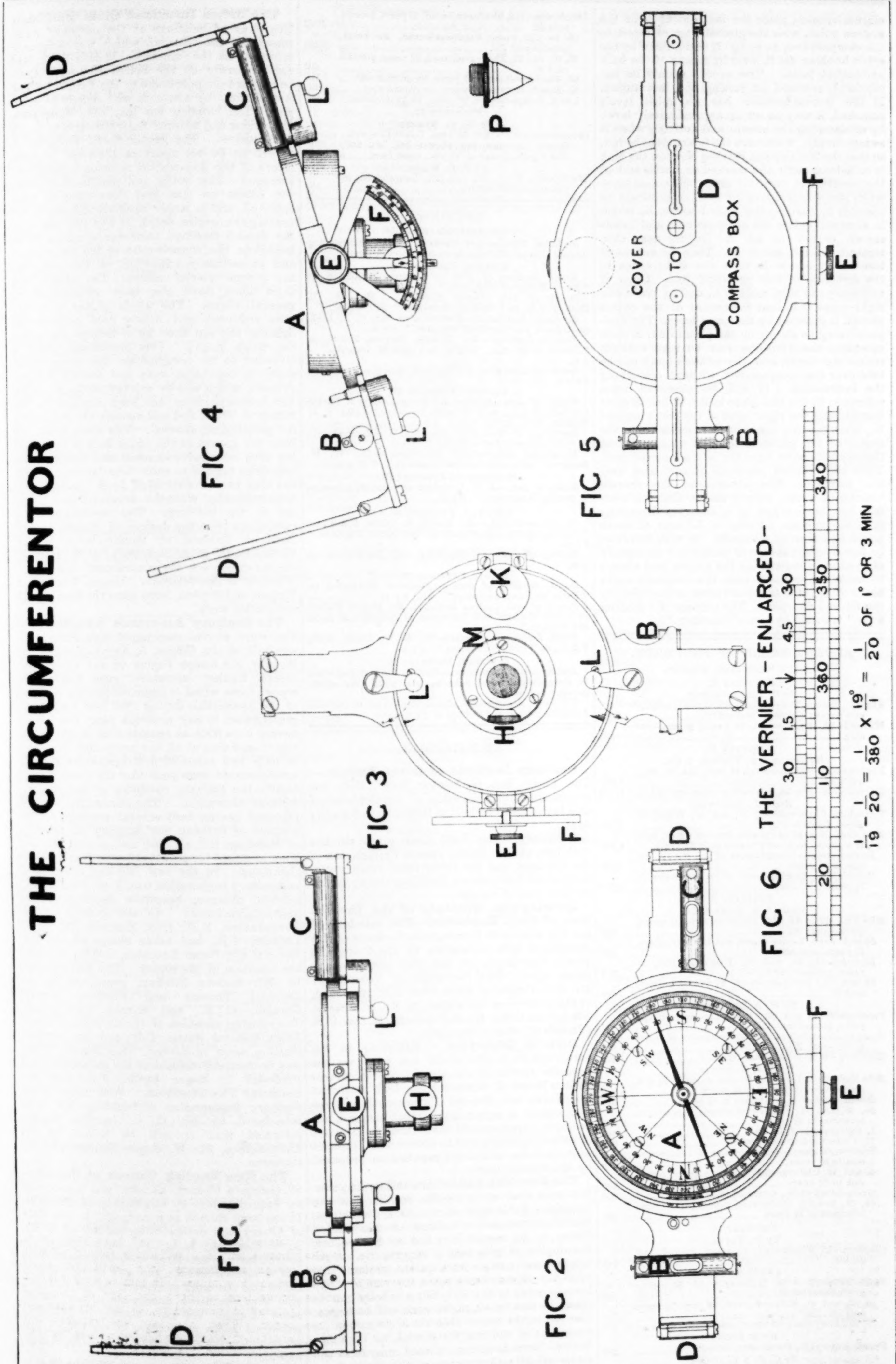
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FIG 1

FIG 2

FIG 3

FIG 4

FIG 5

FIG 6

THE VERNIER — ENLARGED —

$\frac{1}{19} - \frac{1}{20} = \frac{1}{380} \times \frac{19^{\circ}}{1} = \frac{1}{20}$ OF 1° OR 3 MIN circumferentor, place the instrument over the station point, with the gimbal ring clamped to the compass-box, as in fig. 1, and guided by the spirit bubbles, set it level by means of the ball-and-socket joint. The needle should be immediately released on setting the instrument. If the circumferentor has no spirit levels attached, it may be set up approximately level, by unclamping the needle, and noticing when it swings freely. Then turn the instrument round, so that the 360° or point marked N. upon the dial, is coincident with the marked or north end of the needle, and carefully make this coincidence when the needle comes to rest, as accurate as possible by turning the milled screw K, which is situated below the compass-box, and hence shown dotted in fig. 2. Having done this, tighten the set screw H. Then by means of the milled screw K, turn the sight-vanes in the direction of the proposed line. Open if necessary the turn stops L L, and so place the sight-vanes D D that the centre of the object viewed is bisected by the cross hairs. The dial-plate being as shown by the plan in fig. 2, open upwards, the divisions can be read entirely round the circle, and the miner's lamp can be held over the compass-box without disturbing the instrument. It will be observed upon reference to the dial-plate in fig. 2 that in some instruments the right hand of the point marked N., when looking towards the north from the centre of the plate, is lettered west, and that the opposite point upon the left is lettered east. Thus the relative positions of east and west are reversed. The expression, the reverse bearing of a line, simply means that the bearing has been taken in a contrary direction; thus the reverse bearing of 34° east of north would be 34° west of south. It will, however, be found an advantage to maintain a uniformity of method in registering the angles, and always to book the relation that the magnetic north bears to the line of observation as recorded by the figured dial-plate. The process of "dialling a pit" is called by some "latching."

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

February 7.	
By C. Foster & Son.	
Abridge, Essex—The residence called "Whitehall," and house adjoining, freehold	£640
Millwall—32, Maria-street, 34 years, ground-rent 5*l*.	260
February 8.	
By Debenham, Tewson, & Co.	
Finchley-road—An enclosure of land, 12a. 0r. 20p., freehold	1,580
Brixton Rise—No. 34, 52 years, ground-rent 20*l*. ...	1,005
By E. J. Gairdner.	
Tottenham Court-road—8, 10, and 43, Whitfield-street, freehold	2,710
Mile End—Nos. 87 to 115 odd, Buxton-street, held at a peppercorn, with reversion in 3¼ years	4,905
Buxton-street—Ground-rents of 19*l*. 10s., reversion in 3¼ years	1,930
Baker's-row—Ground-rents of 12*l*., reversion in 3¼ years	2,770
February 9.	
By J. & R. Kemp & Co.	
Mile End—17 to 25 odd, Philpot-street, 16 years, ground-rent 16*l*.	650
54 to 60 even, Varden-street, and 17, Gray-street, 13 years, ground-rent 11*l*.	395
Stepney—81, 83, and 85, Exmouth-street, 27 years, ground-rent 7*l*. 10s.	705
72 and 74, Dempsey-street, 27 years, ground-rent 6*l*.	520
By W. A. Blakemore.	
Paddington—36 and 39, Eastbourne-terrace, 52 years, ground-rent 23*l*.	2,160
Hampstead-road—7 and 8, Oakley-square, 57 years, ground-rent 20*l* ...	1,315
Highbury—9, Elwood-street, freehold	265
By E. J. Gairdner.	
Mile End—90 to 110 even, Buxton-street, held at a peppercorn, reversion in 3¼ years	2,820
Ground-rent of 4*l*., reversion in 3¼ years	426
59, 61, and 63, Underwood-street, peppercorn, reversion in 3¼ years	2,700
1, Buttress-street, freehold	245
18, Underwood-street, freehold	660
Underwood-street—Ground-rents of 14*l*., reversion in 3¼ years	2,700
40 and 42, Underwood-street, peppercorn, reversion in 3¼ years	930
Ground-rent of 4*l*., reversion in 3¼ years	440
60, 68, and 70, Underwood-street, peppercorn, reversion in 3¼ years	850
February 10.	
By D. Young.	
Clapham—13, Sibella-road, 75 years, ground-rent 9*l*. 15s.	640
By J. Scott	
Stoke Newington—79, Mildmay-grove, 62 years, ground-rent 6*l*. 10s	310
83, 85, and 91, Mildmay-grove, 62 years, ground-rent 19*l*. 10s.	1,090
77, Mildmay-road, 62 years, ground-rent 6*l*. 6s....	370
By B. Brown.	
Forest Gate—125, Forest-lane, freehold	470
By C. C. & T. Moore.	
Mile End—13, Sydney-square, 13½ years, ground-rent 3*l*.	155
Limehouse—118, Rhodeswell-road, 25 years, ground-rent 3*l*.	£165
94 to 112 even, Rhodeswell-road, 25 years, ground-rent 30*l*.	1,465
88, 90, and 92, Rhodeswell-road, 27 years, ground-rent 6*l*.	440
86, Rhodeswell-road, 27 years, no ground-rent ...	2,750
31, Tomlin-terrace, 27 years, no ground-rent	1,255
1 to 4, Bridge-terrace, 26 years, no ground-rent...	255
February 11.	
By W. C. Heron.	
Commercial-road—24 to 30 even, Lower Chapman-street, 13 years, ground-rent 16*l*. 19s. 6d.; also a ground-rent of 3*l*. 10s., same term	530
By J. P. Rider.	
Westbourne Park—171 and 173, Kensal-road, 90 years, ground-rent 16*l*.	555

MEETINGS.

Saturday, February 19.

Builders' Foremen and Clerks of Works' Institution.—Annual Dinner (Holborn Restaurant). 6·30 p.m.

Monday, February 21.

Royal Academy of Arts. — Professor Middleton on "Early Mediæval Sculpture." I. 8 p.m.

Society of Arts (*Cantor Lectures*). — Mr. W. Y. Dent, F.C.S., on "Building Materials." II. 8 p.m.

Surveyors' Institution.—Discussion on Mr. T. A. Dickson's paper on "Artificial Manures." 8 p.m.

Victoria Institute.—Mr. T. McK. Hughes, F.G.S., on "Caves: their Age, Origin, and Age of Deposit." 8 p.m.

Leeds and Yorkshire Architectural Society.—Associates' *Soirée.*

Tuesday, February 22.

Society of Arts (*Applied Art Section*).—Mr. J. Starkie Gardner, F.G.S., on "Wrought Ironwork." (Mr. E. J. Poynter, R.A., in the chair.) 8 p.m.

Institution of Civil Engineers.—Mr. William Willcocks on "Irrigation in Lower Egypt." 8 p.m.

Manchester Architectural Association. — Mr. W. H. Rawle on "The Architectural Assistant." 7·30 p.m.

Wednesday, February 23.

Society of Arts.—J. W. Urquhart on "Recent Advances in Sewing Machinery." 8 p.m.

Thursday, February 24.

London Institution.—Mr. Harold B. Dixon, F.R.S., on "The Lighthouse Experiments at the North Foreland." 8 p.m.

Society of Telegraph-Engineers and Electricians.—8 p.m.

Friday, February 25.

Royal Academy of Arts. — Professor Middleton on "Early Mediæval Sculpture." II. 8 p.m.

Society of Arts (*Indian Section*).—Mr. Holt S. Hallett on "New Markets and Extension of Railways in India and Burmah." 8 p.m.

Royal Institution.—Captain W. de W. Abney, R.E., F.R.S., on "Sunlight Colours." 9 p.m.

Saturday, February 26.

Architectural Association.—Visit to Sion College and St. George's Cathedral Schools. 2·30 p.m. (See advertisement last week.)

Edinburgh Architectural Association.—Visit to Catholic Apostolic Church and College of Physicians.

Miscellanea.

Sanitary Institute of Great Britain.—The Right Hon. G. Sclater Booth, M.P., has accepted the Presidentship of the Congress of this Institute to be held at Bolton in September next.

Obituary.—The death took place on the 15th inst. of Mr. Henry James Phillips, one of the founders, and for thirty-three years secretary, of the Temperance Building Society, in the sixtieth year of his age.

Birmingham Students of the Institution of Civil Engineers.—The members of the Association of Birmingham Students of this Institution held a meeting at the Colonnade Hotel, New-street, on the 10th inst., when a paper upon "The Sewerage of Towns," by Mr. J. S. Pickering, Stud. Inst. C.E., was read, in the absence of the writer, by Mr. W. Franks, Stud. Inst. C.E. Mr. E. Pritchard, M. Inst. C.E. (President), was in the chair.

District Surveyors. — Referring to the paragraph on p. 270 of our last issue, we see from the *agenda* of the meeting of the Metropolitan Board of Works for the 18th inst. that the Works and General Purposes Committee will present a report stating that they are not prepared to recommend the making, in the cases of future appointments to the office of District Surveyor, the additional regulations proposed by Mr. Samuel Price.

The American Exhibition at Kensington. We hear that work on the buildings of the American Exhibition of the Arts, Industries, Manufactures, and Products of the United States, to be opened May 2nd at Earls-court, Kensington, is progressing very rapidly. Over 400 men are now at work on the grounds, and when the electric-light plant, for which a 600 horse-power engine and boiler are being put in place, is completed, night-work will be begun. The managers report that the applications for space in the building far exceed its capacity. Several large American railroad companies will make exhibits, illustrative of the agricultural and mineral products of the territory through which their lines run.

The Briton Insurance Office Buildings. The block of buildings at the corner of Agar-street, in the Strand, which was originally occupied as the notorious British Bank, and until recently by the Briton Insurance Company, has been purchased by the British Medical Association, by whom it will shortly be occupied. The building has just been undergoing alterations and internal reconstruction to a very great extent. The ground-floor, which is intended to be set apart as the chief business offices of the Association, is being entirely re-arranged. The walls and partitions dividing the offices on the first floor have all been removed, and a larger apartment formed, extending the entire depth of the building from the Strand frontage northwards, which is intended as the council-room of the Association, and immediately adjoining, on the east side, are several clerks' offices. The second and third floors have also been re-arranged as general offices. The whole of the roof has been removed, and a new roof constructed, lighting the top floor by a lantern, carried to the entire length. This last-named floor is intended to be occupied as the compositors' room in connexion with the *British Medical Journal*, which will be printed on the premises. The basement floor has been lowered to the extent of 18 in., and will contain the machinery for printing the *Journal*. The stone staircases from the ground to the upper floor of the building have been reconstructed and diverted, and lavatories formed at each floor landing. A lift has also been constructed from the basement communicating with the several floors to the top of the building. The works are being carried out from the designs of Messrs. Arding, Bond, & Buzzard, of Surrey-street, Strand. Messrs. G. H. & A. Bywaters, of King-street, Regent-street, are the contractors, and Mr. L. Williams is the foreman. Messrs. Wenham & Waters, of Croydon, have done the heating and ventilation work.

The Sanitary Assurance Association.—The sixth annual meeting of this Association was held at the Offices, 5, Argyll-place, W., on Monday, Sir Joseph Fayrer in the chair. Mr. Joseph Hadley, secretary, read the annual report, from which it appeared that the business of the Association during 1886 had been much greater than in any previous year, the income having been 804*l*. as against 462*l*. in 1885. The report said that of all the properties inspected, in only two cases of first inspection had the arrangements been such that the Council could certify the sanitary condition of the property without alteration. The Executive Council reported having held several meetings for the purpose of revising the Sanitary Registration of Buildings Bill of 1886, and a new Bill had been prepared for presentation to the House of Commons. In the new Bill the principle of compulsory registration would be restricted to schools, colleges, hospitals, asylums, hotels, and lodging-houses. In the absence of Dr. Farquharson, M.P., from England, Mr. C. C. Lacaita, M.P., had taken charge of the Bill. General Sir Peter Lumsden, G.C.B., proposed the adoption of the report. This was seconded by Mr. Andrew Stirling, supported by Dr. Danford Thomas and Surgeon-General Cornish, C.I.E., and carried unanimously. The retiring members of the Executive Council, Lieut.-General Burne, C.B., and Mr. Andrew Stirling, were re-elected. Sir Joseph Fayrer was re-elected President of the Association, and Professor T. Roger Smith, F.R.I.B.A. was re-elected Vice-President. With regard to the Sanitary Registration of Buildings Bill, to be introduced by Mr. C. C. Lacaita, we are informed that it will be backed by Dr. Farquharson, Sir W. Guyer Hunter, and Dr. Cameron.

The New English Church at Cannes.—St. George's Church, Cannes, was consecrated on Saturday last by the Bishop of Gibraltar. It has been erected as a memorial to the Duke of Albany, the design being submitted by Mr. A. W. Blomfield, M.A. The decorations of the church include two large stained-glass windows and a mosaic reredos, the gift of two English ladies and the work of Heaton, Butler, & Bayne, who have also other memorials in hand for the same church. We have already (p. 165, *ante*) published some particulars of the church, and we hope to give an illustration of it in an early number.

Theatre Burned Down at Northampton. The New Opera House at Northampton was burnt out early on Sunday morning.

PRICES CURRENT OF MATERIALS.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ton	6	10	0	7	0	0
Teak, E.I. load	9	0	0	14	0	0
Sequoia, U.S. foot cube	0	2	0	0	2	6
Ash, Canada load	3	0	0	4	10	0
Birch ,,	2	5	0	3	10	0
Elm ,,	3	10	0	4	10	0
Fir, Dantsic, &c.	1	10	0	4	0	0
Oak ,,	2	10	0	4	10	0
Canada	3	0	0	6	0	0
Pine, Canada red	2	0	0	3	10	0
,, yellow	2	5	0	4	0	0
Lath, Dantsic fathom	3	0	0	5	0	0
St. Petersburg	4	0	0	5	10	0
Wainscot, Riga log	2	15	0	4	0	0
,, Odessa, crown	3	5	0	3	7	6
Deals, Finland, 2nd and 1st std.100	7	0	0	8	0	0
,, 4th and 3rd	5	10	0	6	10	0
Riga	5	10	0	7	0	0
St. Petersburg, 1st yellow	8	10	0	14	0	0
,, 2nd ,,	7	0	0	8	0	0
,, white	6	0	0	9	0	0
Swedish	6	0	0	15	0	0
White Sea	7	0	0	16	10	0
Canada, Pine, 1st	17	0	0	27	0	0
,, ,, 2nd	11	0	0	16	0	0
,, ,, 3rd, &c.	6	0	0	8	0	0
,, Spruce, 1st	8	0	0	10	0	0
,, ,, 3rd and 2nd	5	0	0	7	0	0
New Brunswick, &c.	5	0	0	7	0	0
Battens, all kinds	4	0	0	12	0	0
Flooring Boards, sq. 1 in., prepared, First	0	8	0	0	11	6
Second	0	6	6	0	7	6
Other qualities	0	5	0	0	6	0
Cedar, Cuba foot	0	0	3	0	0	3½
Honduras, &c.	0	0	2½	0	0	3½
Australian	0	0	2	0	0	3
Mahogany, Cuba	0	0	4	0	0	6
St. Domingo, cargo average	0	0	4	0	0	6
Mahogany, Mexican, cargo av.	0	0	3½	0	0	4½
Tobasco ,,	0	0	4	0	0	6
Honduras ,,	0	0	4	0	0	6
Maple, Bird's-eye	0	0	6	0	0	8
Rose, Rio ton	7	0	0	10	0	0
Bahia	6	0	0	10	0	0

TIMBER (*continued*).	£.	s.	d.	£.	s.	d.
Box, Turkey ton	5	0	0	15	0	0
Satin, St. Domingo foot	0	0	6	0	0	10
Porto Rico	0	0	6	0	0	10
Walnut, Italian	0	0	4	0	0	5

METALS.	£.	s.	d.	£.	s.	d.
IRON—Bar, Welsh, in London ton	4	7	6	4	15	0
,, ,, in Wales	4	2	6	4	7	6
,, Staffordshire, London	5	10	0	6	0	0
Sheets, single, in London	6	15	0	8	10	0
Hoops ,,	6	0	0	7	0	0
Nail-rods ,,	5	15	0	6	10	0
COPPER—						
British, cake and ingot ton	42	0	0	43	0	0
Best selected	43	0	0	44	0	0
Sheets, strong	50	0	0	51	0	0
Chili, bars	39	10	0	40	0	0
YELLOW METAL lb.	0	0	$4\frac{1}{16}$	0	0	4¼
LEAD—						
Pig, Spanish ton	12	13	9	0	0	0
English, common brands	13	0	0	0	0	0
Sheet, English	13	16	3	14	0	0
SPELTER—						
Silesian, special ton	14	7	6	14	10	0
Ordinary brands	14	5	0	14	7	6
TIN—						
Straits ton	101	2	6	101	10	0
Australian	101	7	6	102	0	0
English ingots	106	0	0	0	0	0

OILS.	£.	s.	d.	£.	s.	d.
Linseed ton	20	12	0	20	17	6
Cocoanut, Cochin	35	10	0	37	0	0
Ceylon	26	0	0	26	5	0
Palm, Lagos	23	0	0	0	0	0
Rapeseed, English pale	23	5	0	0	0	0
,, brown	21	15	0	22	0	0
Cottonseed, refined	18	5	0	20	0	0
Tallow and Oleine	25	0	0	45	0	0
Lubricating, U.S.	5	0	0	7	0	0
,, refined	5	0	0	12	0	0
TURPENTINE—						
American, in casks cwt.	1	8	0	0	0	0
TAR—						
Stockholm barrel	0	15	0	0	15	6
Archangel	0	12	6	0	0	0

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Burial Ground	Dorking Burial Board	10*l.* and 5*l.*	March 16th	ii.
New Ladies' Hall, Belfast	Sir Wm. McArthur	Not stated	March 31st	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Steam Road Roller	Grimsby U. S. A.	Jno. Buchan	Feb. 22nd	ii.
Granite and Asphalte Paving	Clerkenwell Vestry	*Official*	Feb. 24th	xx.
Pipe Sewer	do.	do.	do.	ii.
Materials and Works	St. George-in-the-East	do.	do.	ii.
Hospital Buildings, Merthyr	The Committee	T. C. Wakeling	do.	ii.
Railway Siding	Brighton Town Council	P. C. Lockwood	Feb. 25th	ii.
Clearing Site, Shaftesbury-avenue		C. J. Phipps	do.	ii.
Asphalte Carriageway Pavement	Com. of Sewers	*Official*	do.	ii.
Materials and Works	Surbiton Imp. Com.	do.	Feb. 28th	xx.
Main Drainage Works	Finchley Local Board	G. W. Brumell	do.	xx.
Stables, Hay Stores, &c., Fulham	Batey & Co., Lim.	*Official*	do.	xx.
Sewering, Levelling, Paving, &c., Works	Hendon Local Board	S. S. Grimley	do.	ii.
Firewood	Epsom Union	*Official*	March 1st	xx.
Making-up Road	Wandsworth Bd. of Wks	do.	do.	xx.
Disposal of Dust and Ashes	Bermondsey Vestry	do.	March 2nd	xx.
Works and Materials	Hammersmith Vestry	do.	do.	ii.
Wood Paving Works	Chiswick Local Board	A. Ramsden	do.	xx.
Iron Railing	Fulham Burial Board	*Official*	March 5th	ii.
Offices and Board-Room	Worthing Local Board	do.	March 7th	xx.
Sewer Pipes and Gully Traps	Bath U. S. A.	C. R. Fortune	do.	ii.
Street Paving	Glasgow Magistrates	*Official*	do.	ii.
Reservoir, &c.	Clitheroe Cor.	McLandsborough & Preston	March 8th	ii.
New Sewers	Com. of Sewers	*Official*	do.	ii.
Alterations and Enlargement of Workhouse	Prestwich Union	Worthington & Elgood	March 10th	ii.
Sludge-Pressing Machinery	Acton Local Board	C. N. Lailey	Not stated	xx.
Erection of Cottages, Alterations, and New Stables	Lord of the Manor, Boscastle	T. Mullett Ellis	do.	xx.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Surveyor and Engineer	Walthamstow Local Bd.	300*l.*	March 4th	xvi.

TENDERS.

BATTERSEA.—For the erection of a Baptist Chapel in the Northcote-road, for the Rev. C. E. Stane and Building Committee. Mr. E. W. Mountford, architect. Quantities by Mr. H. R. Pollard:—

Smith	£6,091	0	0
Adamson	5,898	0	0
Nightingale	5,592	0	0
Higgs & Hill	5,484	0	0
King & Son	5,452	0	0
Gray	5,330	0	0
Chappell	5,288	0	0
Holloway	5,239	0	0
Johnson (accepted)	5,230	0	0

BARNET.—For erecting two cottages at the Irrigation Farm, East Barnet, for the East Barnet Valley Local Board:—

C. E. Noble	£463	17	0
C. Brown	446	0	0
S. Woodhall	388	0	0
J. Ellwood	380	0	0
A. R. Flew & Co.	380	0	0
C. Newby	373	0	0
G. Daniels	373	0	0
Harrison & Crabb	368	0	0
H. Norman	367	5	0
A. Nash	356	12	9
J. Curnow	339	0	0
F. J. Wheeler & Co.	335	15	0
Brooks & Meader	313	0	0
W. Pavey	296	0	0

BRACKNELL (Berks).—For the erection of Gothic lodge, "Martin's Heron," for Major-Gen. Milman. Mr. Frederic W. Fryer, architect, Pancras-lane:—

Jas. Waddington (accepted)	£180	0	0

[No competition.]

BERMONDSEY.—For rebuilding factory premises at Millstream-road, Dockhead (lately burned down), for Mr. William Joyce. Mr. Edward Crosse, architect, Bermondsey-square:—

Smith & Son	£1,777	0	0
Clarke & Bracey	1,643	0	0
Grover & Son	1,638	0	0
A. White & Co.*	1,597	0	0

* Messrs. A. White & Co.'s amended tender (to include additional works in floors and roof), £1,669, accepted.

BERMONDSEY.—For erecting furnace chimney-shaft, 80 ft. high, at the Manor Oil Works, Galley Wall-road, South Bermondsey, for Messrs. Johnson, Cale, Brier, & Cordrey (Limited). Mr. Edward Crosse, architect:—

B. Wells, Bermondsey	£265	0	0
J. Appleby, Lambeth	255	0	0
W. Shepherd, Bermondsey (accepted)	225	0	0

CLAPHAM.—For alterations and additions to business premises, High-street, Clapham, for Mr. W. Edwards. Mr. J. William Stevens, architect, 21, New Bridge-street:—

White & Co.	£198	0	0
Lamprell (accepted)	147	0	0

EDMONTON.—For the erection of chimney shaft at the Edmonton Workhouse, for the Edmonton Board of Guardians:—

Waite	£180	0	0
Linzell	150	0	0
Franklin	147	0	0
Neal	126	0	0
Ivory	125	0	0
Brooks & Meader (accepted)	121	19	0

EXETER.—For the restoration of the interior of the Guildhall, Exeter, including panelling, re-seating, upholstering, flooring, heating, ventilating, masonry, &c.* Mr. E. Lyne Parsons, architect, High-street, Exeter:—

W. Dart, Crediton (accepted)	1,251	11	0

GREENWICH.—For the erection of saw-mills and office, for the Improved Wood Pavement Company, at East Greenwich, under the superintendence of Mr. William Eve, architect, Union-court, Old Broad-street:—

Docwra	£1,395	0	0
Perry	1,356	0	0
Brass	1,347	0	0
Reading	1,335	0	0
Downs	1,334	0	0
Kirk & Randall	1,320	0	0
Harris & Wardrop	1,318	0	0
Salt	1,297	0	0
Holland	1,249	0	0
Stubbs	1,200	0	0
Higgs	1,170	0	0

HAMMERSMITH.—For the erection of bakery and stable, for the Hammersmith Co-operative Society (Limited). Mr. C. P. Edwards, architect:—

	Ovens.		Bakery.		Total.	
O. Plumridge	£95	0	£240	0	£335	0
G. Harrington	130	0	197	10	327	10
Webb & Rosser*	113	16	174	18	288	14

* Accepted.

HASTINGS.—For the restoration of premises, High-street, Hastings, for Mr. J. Griffith Richards. Mr. Henry Ward, architect, Hastings:—

C. Tanner	£1,197	0	0
W. E. Warman	1,155	0	0
Moon & Gardner	1,098	9	3
H. Charman	1,094	18	0
A. White	1,093	0	0
A. Vidler	1,056	0	0
H. Ditch	1,042	0	0
J. Taylor	1,020	0	0
W. Elliott (accepted)	1,000	0	0

LONDON.—For the completion of No. 15, Clarence-terrace, Brondesbury-road, Kilburn, under the superintendence of Mr. William Eve, architect, Union-court, Old Broad-street:—

Rowe	£325	0	0
Salt	323	0	0
Higgs	300	0	0
Baber	270	0	0
Jones	200	0	0
Wadsworth	200	0	0
Shakespear	160	0	0

LONDON.—For the completion of No. 17, Clarence-terrace, Brondesbury-road, under the superintendence of Mr. William Eve, architect:—

Salt	£405	0	0
Higgs	380	0	0
Rowe	350	0	0
Baber	300	0	0
Jones	250	0	0
Wadsworth	250	0	0
Shakespear	210	0	0

LONDON.—For the extension of premises at Pear-tree-street, Goswell-road, for Messrs. Carter, Paterson, & Co., under the superintendence of Mr. William Eve, architect:—

Holland	£1,233	0	0
Johnson	1,157	0	0
Harris & Wardrop	1,127	0	0
Downs	1,087	0	0
Godfrey	1,075	0	1
Higgs	1,04[illegible]	0	0
Brass & Son (accepted)	1,033	0	0

LONDON.—For the completion of No. 19, Clarence-terrace, Brondesbury-road, under the superintendence of Mr. William Eve, architect:—

Salt	£391	0	0
Higgs	379	0	0
Rowe	350	0	0
Baber	300	0	0
Jones	250	0	0
Wadsworth	250	0	0
Shakespear	210	0	0

LONDON.—For alterations at the Grapes Public-house, Mill-street, Hanover-square, for Mrs. Brook. Mr. F. Ponler Telfer, architect, Chancery-lane. Quantities supplied:—

	£	s.	d.
Wood	£895	0	0
Chessum	768	0	0
Campkin	761	12	0
Castle	744	0	0

LONDON.—For sundry alterations and fittings at the Green Man Public-house, 383, Euston-road. Messrs. Walters & Bird, architects. Quantities supplied:—

	Fittings, &c. in Cuba.	Deduct if Pitch-pine.
Williams	£2,844	£259
Perkins	2,526	245
Goodall	2,508	145
Fotheringham	2,439	250
Anley	2,325	270
Mark	2,310	300
Birch	2,257	225
Goad	2,248	300

LONDON.—For pulling down and rebuilding Gothic entrance gateway, 372, Euston-road, for Messrs. Gray & Davison (Limited), in conjunction with the new building:—

	£	s.	d.
Rhodes, Hyde Park	£120	0	0

[No competition.]

LONDON.—For alterations and new shop front to No. 22, Devonshire-street, Portland-place, for Mrs. Mary Dumdell. Messrs. Habershon & Fawckner, architects, Bloomsbury-square:—

	£	s.	d.
Wm. Groom, Dulwich (accepted)	£571	0	0

[No competition.]

NORBITON (Surrey).—For the erection of a pair of villas, Liverpool-road, Norbiton, Surrey, for Mr. J. A. Clemence. Mr. Henry Macaulay, architect. Quantities supplied:—

		Verandah, &c.
Henley, Norbiton	£1,785	£243
Collins, Kingston	2,562	221
Lane, Kingston	2,500	217
W. Oldridge, Kingston	2,325	219
G. Constable, Hampton Wick	2,300	223

NORBITON (Surrey).—For the erection of a villa residence at Norbiton. Mr. J. T. Sabrum, architect, St. James-road, Forest-lane, Stratford:—

	£	s.	d.
T. & J. Drake, Coburg-road	£510	0	0
W. Atkinson, Norbiton	485	0	0
W. R. Wood, Hampton Wick	425	0	0
G. Huckle, Norbiton (too late)	415	0	0
A. Brett, Hampton Wick	410	0	0
Howard & Johnston, Camberwell	407	10	0
Henley & Co., Upper Norwood	388	0	0
Newton & Idle, Clapham	387	0	0
A. E. Addis, Hounslow	377	0	0
R. L. Wood, East Greenwich	375	0	0
W. Hickinbotham, Teddington	365	0	0
Aylott & Co., Theobald's-road	310	0	0
E. Woodhouse, Stenley-road, Woodford (accepted)	255	0	0

SPECIAL NOTICE.—Lists of Tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, W.C., *not later than Four p.m.* on THURSDAYS.

TO CORRESPONDENTS.

Registered Telegraphic Address, "The Builder, London."

E. B. (space is too much occupied at present).—W. de G. B.—F. G. C.—C. S—F. J. B.—W. W.—L. H. I.—S. R. J. S. (below our mark).—N. O. P. (write to Crosby Lockwood & Co., B. T. Batsford, or E. & F. N. Spon, publishers, London).—H. S. Co.—E. K. (next week).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

PUBLISHER'S NOTICES.

Registered Telegraphic Address, "The Builder, London."

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE, AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under	4s. 6d.
Each additional line (about ten words	0s. 6d.

Terms for Series of Trade Advertisements, also for special Advertisements on front page, Competitions, Contracts, Sales by Auction, &c. may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about THIRTY words) or under	2s. 6d.
Each additional line (about ten words)	0s. 6d.

PREPAYMENT IS ABSOLUTELY NECESSARY.

⁂ Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Money Order, payable at the Post-office, Covent-garden, W.C. to

DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine-street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent.

PERSONS Advertising in "The Builder," may have *Replies addressed to the Office*, 46, Catherine-street, Covent Garden, W.C. *free of charge*. Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

AN EDITION Printed on THIN PAPER, for FOREIGN CIRCULATION, is issued every week.

FIRE BRICKS.
E. BOWEN, Fire Brick Manufacturer, STOURBRIDGE.
Manufacturer of Best Stourbridge Fire Bricks, and Cement Fire Clay, Gas Retorts, Muffles, &c. Fire Bricks and Blocks for the Highest Heats, for Iron Blast Furnaces, Forge, Rolling, Puddling, and Steel Furnaces, Pottery, Bottle, and Flint Glass Furnaces, Roasting and Refining Furnaces, Chemical Works, Coke Ovens, &c. Boiler Seating Blocks, Flue Covers, Locomotive Bricks, Tuyeres, Steel Runners, Grate Backs.
Special Sizes and Shapes made to Engineers' Drawings.
Prices quoted to any Port or Railway Station.
London Agents:—
R. CULL & SON, *Palmerston-buildings, E.C.*
Stores:—Railway Arches, Corner of London-street and Brady-street, near Bethnal Green Station.

GLAZED BRICKS.
OATES & GREEN, HALIFAX.
GLAZED BRICKS (White and Coloured), Special Salt Glazed Bricks Sanitary Tubes, Glazed Earthernware Sinks, Cattle, Sheep, and Pig Troughs, Horse Mangers, Patent Automatic Trough Closet, Patent Flush Tank, Channelling for Stables and Yards, Salt Glazed Bricks for Stables, Sewers, &c. Ventilating Bricks, Patent Ventilating Gullies and Traps, Garden Edging, Patent Chimney Pots and Cures for Down Draughts, Patent Drain-Cleaning Rods.
Six Prize Medals. Copies of Testimonials sent if required.
London Agents:—
R. CULL & SON, Palmerston-buildings, E.C.
Stores:—Railway Arches, Corner of London-street and Brady-street, near Bethnal Green Station.

BLUE BRICKS.
THE KETLEY BRICK COMPANY, Manufacturers of Staffordshire Blue Bricks, KINGSWINFORD, near Dudley, Staffordshire.
London Agents:—
R. CULL & SON, Palmerston-buildings, E.C.
Stores:—Railway Arches, Corner of London-street and Brady-street, near Bethnal Green Station.

DRAIN PIPES.
Lime, Cement, Bricks, Slates, Laths, Hair, Sand, Plaster, Stable Paving Bricks, Wall Copings, Channel Bricks, Blue and Red Ridges, Red Plain Tiles and Pan Tiles, Closet Pans and Traps. Drain Pipes, Bends, Junctions, &c. all sizes. Chimney-Pots, Red and White, Fire Bricks, Lumps, Tiles, Fire Clay. PRICES on APPLICATION.
R. CULL & SON'S Stores, Railway Arches, Corner of London-street and Brady-st., near Bethnal Green Station.
Chief Office:—72, Palmerston-buildings, Old Broad-street, E.C

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum PREPAID. To all parts of Europe, America, Australia, and New Zealand, 26s. per annum. To India, China, Ceylon, &c. 30s. per annum. Remittances payable to DOUGLAS FOURDRINIER, Publisher, No. 46, Catherine-street, W.C.

Best Bath Stone.
CORSHAM DOWN, } SUMMER DRIED.
FARLEIGH DOWN, }
BOX GROUND. COMBE DOWN.
WESTWOOD GROUND.
RANDELL, SAUNDERS, & CO., LD.,
CORSHAM, WILTS.

Bath Stone.
BEST QUALITY OF ALL KINDS.
PICTOR & SONS,
Box, Wilts. [Advt.

Doulting Freestone and Ham Hill Stone of best quality, in blocks, or prepared ready for fixing. An inspection of the Doulting Quarries is respectfully solicited; and Architects and others are CAUTIONED against inferior stone. Prices, delivered to any part of the United Kingdom, given on application to CHARLES TRASK & SONS, Norton-sub-Hamdon, Ilminster, Somerset.—Agent, Mr. E. WILLIAMS, No. 16, Craven-street, Strand, W.C. [Advt.

Doulting Free Stone
HAM HILL STONE,
BLUE LIAS LIME
(Ground or Lump),
For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [Advt.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [Advt.

Asphalte.
Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.
Office:
No. 90, Cannon-street, E.C. [Advt.

MICHELMORE & REAP,
Manufacturers of

CHARLES COLLINGE'S PATENT.

COLLINGE'S PATENT HINGES,
LEVER, SCREW, & BARREL BOLTS,
Self-Acting "FALL DOWN" GATE STOPS,
and IMPROVED GATE FITTINGS of every Description
36A, BOROUGH ROAD,
DISCOUNT TO BUILDERS. LONDON S.E.,

Map of London,

SHOWING BOUNDARIES OF SURVEYORS' DISTRICTS.

The four Sheets, into which the Map is divided (issued with the numbers of January 1st, 8th, 15th, and 22nd), if sent to the Office direct, or through any Newsagent, can be

MOUNTED ON THE FOLLOWING TERMS, VIZ.:—

On Cloth (Rollers) and varnished, 3s. 6d. | On Cloth (Strainer) and varnished, 5s. 6d.

N.B.—In the case of "Strainers," if packed for rail or carrier, 1s. 3d. extra.

⁂ Omissions discovered since publication will be corrected before mounting.

BRABY'S PATENT GLAZING.
GLASS SET FREE,
ALLOWING EXPANSION AND CONTRACTION, AND PRECLUDING BREAKAGE.
ABSOLUTELY WATERTIGHT. PAINTING AND PUTTY SUPERSEDED.
OVER THREE MILLION FEET FIXED.
DRAWINGS AND PRICES ON APPLICATION.
-MODELS AND SECTIONS ON VIEW.-
LONDON: 352 to 364, EUSTON ROAD.
LIVERPOOL: 6 and 8, HATTON GARDEN.
GLASGOW: 335, ARGYLE STREET.